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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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"Results of operation" and the "condensed balance sheet" failed to fill two pages, one leaf, of the recent Missouri Pacific report. It is somewhat difficult to bind a single leaf in a pamphlet, and it is uneconomical to print a form of less than four pages; but this difficulty has been overcome by a somewhat enlarged record of turbulent Nature's dealings with this property. We are told that the early part of the year "was marked by extremely cold weather and severe snowstorms in January and February." These seasonable incidents were succeeded by rain—which made it bad. We learn, too, that the "appearance of yellow fever in July" was unexpected. The habit of disaster is an acquired taste, and by early autumn the management records that their "unfortunate condition was supplemented by a shortage in the cotton crop," and lightly touches on the fact that "later in the year a renewal of the flood conditions hereinbefore referred to affected your lines." The writer of the report slowly recovers poise and good cheer after these lamentations, and perhaps has read in Tennyson's Ulysses that "Though much is taken, much abides," for the meagre figures show that, although "smitten of God and afflicted," the company almost earned its regular dividend. Indeed, they came so near earning it that they paid it.

> "I loved the garish day, and spite of fears,
> Pride ruled my will; Remember not past years."

But we can't help doing so, and this tale of heroic happenings whets our appetite for the literature in the same company's reports in "past years." We find that in 1903 "during the months of April and May that portion of the states of Missouri, Kansas and Nebraska traversed by the Missouri Pacific Railway was visited by continuous heavy rains." The M. P. management must feel, with Noah, that "water has tasted of sinners ever since the flood." Notice, too, that we are not told that these three states suffered as a whole; the visitation fell upon "that portion traversed by the Missouri Pacific." The inference is obvious: hostile interests, perhaps the Rock Island, have been praying for rain. In 1904 the sun reappeared, only to hide again, as we have seen, in 1905. But this abject submission to the forces of Nature is now a thing of the past. The management has gone to the root of the matter, noted that these disasters occurred only in the odd numbered years, and so has altered their fiscal year to end June 30, completely disabling the arithmetic of the elements, and, like the crew of the "Bolivar,"

> "Euchered God Almighty's storm,
> Bluffed the eternal sea."

The moral, the serious undertaking in this brief mention, is that Nature's behavior in the Southwestern states has been observed, recorded, and paid for during many years, so that, with all facts known, the engineer, whose office is to direct the sources of power in Nature for the use and convenience of man, has a comparatively easy problem to solve, if the management tells him to save money in that way.

The "Yoakum System" is coming to be more and more often commonly spoken of as though under this name there were as distinct a group of railroads as those controlled by Mr. Harriman or Mr. Hill. The growing prominence of Mr. B. F. Yoakum in the railroad world is one of the noteworthy signs of the times, particularly in the railroad development of the Southwest. Since 1904 Mr. Yoakum, previously President, has been Chairman of the Executive Committee of the St. Louis & San Francisco. Last December, on the rearrangement of offices due to the retirement of Mr. Leeds from participation in Rock Island affairs, he was made Chairman of the same Committee of the Chicago, Rock Island & Pacific Railway. In these two positions he directs a combined system of something over 14,000 miles of line, a group which, although not confined to that section of the country, essentially belongs to the Southwest. There is another road in which Mr. Yoakum is a not unimportant director—the Colorado & Southern—which, with its Fort Worth & Denver City line, reaches from Denver southeast into Texas as far as Fort Worth, where it connects with both the Rock Island and the Frisco Systems. The other important line already in operation in which Mr. Yoakum is interested is the St. Louis, Brownsville & Mexico, which has track laid from Brownsville at the extreme southernmost point of Texas, north along the coast to within less than 50 miles of Houston and Galveston. Of this road Mr. Yoakum is President. At least two other roads of which Mr. Yoakum is more or less completely in control are aiming at Houston and Galveston. From the east the Colorado Southern, New Orleans & Pacific is already at work on a New Orleans-Houston line paralleling the Southern Pacific. The new company expects to have trackage rights over the Yazoo & Mississippi Valley from New Orleans to Baton Rouge, to build from Baton Rouge west to a point on the Kansas City Southern, 47 miles of which into Beaumont is to be used under trackage rights, and after using the present line, improved, of the Beaumont, Sour Lake & Western for a short distance west of Beaumont to build over the remaining distance into Houston. It has this month sold $7,500,000 notes to obtain funds for construction. From the north, the Colorado & Southern's extension to the Gulf also has

Houston and Galveston as its objective points. Bonds to the amount of $100,000,000 have been authorized, and of this amount $17,000,000 issued and sold to finance this and other extensions. The Trinity & Brazos Valley, a 77-mile road in Texas, has been bought, and is to be used as part of the new line. On completion of the Fort Worth-Houston line a Gulf outlet may be provided, not only for the Colorado & Southern, but for the Rock Island and Frisco Systems as well, each of which already runs into Fort Worth, and has long looked toward Galveston with envious eyes. Thus all the railroads with which Mr. Yoakum is identified seem to be converging on the most important Gulf outlet in Texas—through Houston and Galveston. At the same time, both the Frisco and the Rock Island are reaching south toward New Orleans. The Frisco already gets to this, the most important Gulf port, by trackage rights over the Mobile & Ohio. In New Orleans it shares with the Southern Railway, ownership of the New Orleans Terminal Company, which is building large terminal accommodations for these roads. South from Little Rock, Ark., the Rock Island has nearly completed a connection with the recently purchased Arkansas Southern, which, with a southern extension already built, brings it into Louisiana to within 250 miles of New Orleans. These are accomplished facts. There is also news of other plans under the direct leadership of Mr. Yoakum. These include the acquiring and connecting up of various short local lines in Texas and the establishing of a shorter Rock Island line into Mexico. In accomplishing the latter object the St. Louis, Brownsville & Mexico is to be used. Once the Rock Island and Frisco reach Houston and Galveston, this road, its extensions to those cities completed, would bring them to the mouth of the Rio Grande river. Across the river from Brownsville is Matamoras, the terminus of the Matamoras branch (lately made standard gage) of the National Railroad of Mexico, over which the Rock Island would have a connection to Mexico City some 800 miles shorter than its present connection via El Paso and the Mexican Central. If the St. Louis, Brownsville & Mexico should carry out its reported plan for a line of its own across the Rio Grande river at Brownsville and south along the east coast of Mexico, at present unoccupied by a railroad, to Tampico, and eventually southwest to Mexico City, a large additional amount of distance would be saved. This may be far in the future, but it seems highly probable that connection will soon be established with Mexico by way of Brownsville. Some of these developments, no doubt, are considerably in advance of Mr. Yoakum's present plans, but taking into account only those which are definitely decided on, it is no wonder that the Rock Island and Frisco Chairman is coming to be credited with headship of a system of his own. If he is soon to control allied railroads connecting Chicago with the Gulf, Chicago with Colorado, Colorado with Galveston and Galveston with New Orleans, together with a new short line into Mexico and a more extensive system of intermediate feeders and connecting lines even than at present included in his two largest railroads, the "Yoakum system," will be a very definite reality.

THE PATERNITY OF STRIKES.

A short story of the anthracite coal strike of 1902 is told in another column by Dr. Warne, who watched and studied closely its incidents as they occurred at the time. It is printed now "lest we forget" what then occurred, and the basic principles which were violated both in the beginning of the strike and in the interference, improper in form, which led to the appointment of the commission. In this land of liberty every man should conduct his business lawfully, and he is entitled to the protection of the law. It is axiomatic that a strike is inseparable from violence and lawlessness. It should not be so, for a strike is a lawful undertaking; but ignorant human nature is such that until that time when the public recognizes the necessity for the immediate protection of property and life when a great strike is ordered, there is certain to follow a period of killing, wounding, boycotting and destruction.

The report of the Anthracite Coal Strike Commission clearly shows and the data in its appendices confirm the fact that if the authorities of the State of Pennsylvania had simply enforced existing laws and had taken the necessary precautions at the beginning of the strike, when violence was inevitable, that a result better and more enduring, alike for the men, the operators and the public, would have been secured. It is easy to say that employees are at the mercy of their employers, but it is quite equally true that the employers are at the mercy of their employees—sustained, supported and protected by all lawful means, as workmen nearly always are, by the communities, by the state and by the national government. The control of corporations by either the national government or by the states is complete. It needs simply to be rationally enforced, but not enforced in a way to harass or destroy the usefulness of these corporations. The public lends a quick ear of sympathy to oppressed employees, and when such oppressions are presented at court or to legislative bodies, or even in the newspapers, the remedy comes as quickly, and probably more quickly, than it does to employers when they are treated with like injustice.

The commission supplemented its decision in declining to make an award "which would compel an agreement by the operators with the United Mine Workers of America" by a considerable discourse, making it clear that here a principle was involved; and the commission made its awards on the several questions at issue between the several operators and "their respective employees, whether the latter belonged to a union or not." Award No. 11 is as follows:

> "That no person shall be refused employment, or in any way discriminated against, on account of membership or non-membership in any labor organization; and that there shall be no discrimination against, or interference with, any employee who is not a member of any labor organization by members of such organization."

The arrogance of the leaders, who are primarily agitators, of the United Mine Workers of America is shown by their quick departure in the beginning of the present negotiation, not simply from the rules of procedure and methods of conciliation provided by the commission, but from the principles made clear in the above quotations. They demand not simply a recognition of their union as a party to the contract, but also demand that the employers of labor in the anthracite coal region shall arbitrarily deduct from the wages of employees the amount of the dues of each individual as a member of the union and pay the gross sum over to the treasurer of the union. It is as if one nation in hostile relations with another nation should be compelled in intervals of peace to aid in placing the bonds to secure the money to pay the costs of the other nation's warlike preparations.

Looking back over the record of many employer and employee struggles, and especially the strike of 1902 in the anthracite region, it seems difficult to come to any other conclusion than that the interference by the President of the United States was harmful. This is a republic—a government by the people. Tyranny is abhorrent. Paternal government is distasteful. This is the United States of America; it is not Russia. We have no "White Czar." We must learn, and we are learning, to govern ourselves—to settle our own individual disputes either privately or in the courts of law. That habit of mind which leads individuals or associations of individuals to go beyond the law is like Bret Harte's men in pursuit of some murder suspects. One of them says: "We have no warrant." The leader says: "We have five good men, and don't need no damn warrant." It is also shown in another less crude but, as we believe, more dangerous form in overlooking the municipalities and the courts and appealing directly to the President of the United States for interference in the constituted order. It is dangerous, weak, unmanly and infantile.

ELECTRIC SYSTEMS FOR HEAVY RAILROAD SERVICE.

The letter in another column from Mr. Wilgus is one of several reasons for returning to this subject, which was editorially discussed two weeks ago. We then simply undertook to summarize the more important arguments and facts contained in the long papers presented before the New York Railroad Club, so as to make them available by non-technical railroad officers. This necessarily resulted in calling attention to apparently conflicting statements, but it should be borne in mind that Mr. Wilgus was induced to contribute to the discussion by the highest motives—that of giving to railroad officers a summary of the results of his long study for a safe and reliable electric traction system under the governing conditions existing on his own road.

In substituting electric for steam traction on a busy line it would be reckless to use other than "well-tried apparatus that has passed beyond the experimental stage." Mr. Wilgus' protected, under-contact, conductor rail "has been in actual use near Schenectady, both experimentally and otherwise, for nearly a year under the most severe conditions in temperature changes, snow and sleet storms, and actual operation of both steam and electric equipment." Its successful operation in a sleet storm is described in another column. If, in its severe trial, all kinds of equipment which is to be used have passed safely over this experimental installation, then it may fairly be said that the under-contact conductor has passed beyond the experimental stage and is "well tried." We do not mean to

question it, if in this year of trial of this conductor rail all the working conditions of a great railroad, including a position of safe clearance, were met. It was not accepted by the engineers of the other Eastern roads who were called in conference during the past year to try to standardize the position of conductor rails, but we understood at the time that among the objections were novelty, height and consequent reduction of clearance, and the mechanical difficulties of under contact, which have been overcome.

This seems to be the proper place to say that the editorial referred to contained one inexcusably careless sentence. No "holocaust" has been reported to have been caused by a derailment and contact of the car body with the conductor rail; and yet no one will deny that the conditions are ripe for it. The sentence should have been a more careful reference to the train burnings caused by short-circuiting in the Mersey tunnel in December, 1902, in the Paris Metropolitan, August, 1903, and in the New York subway in March, 1905. The causes are alike, and the result is the same as may be expected to come from a wreck driven over a conductor rail.

Of losses of life, due to the conductor rail, by employees and trespassers no record is available in this country. In England, on the small number of electrified miles of the Northeastern and the Lancashire & Yorkshire railways, these were, in 1904, seven killed and eight injured trespassers, and one killed and twelve injured employees and "persons on business." This total of about one man for each two miles of road per year occurred on lines much more carefully hedged and patrolled than are American roads. Nevertheless, we should not exaggerate this danger, for these losses should decrease year by year, and also have a recompense of less trespassing with its attendant dangers.

Through bridges for trains or overhead trusses for signals or single-phase current wires have a degree of danger, and Mr. Wilgus gives some facts. On four-track roads the signal trusses and enough additional trusses to make intervals of 300 ft. are to carry the a.c. wires, and by so much increase the number of supporting columns to be hit by derailed trains. On double-track lines, with the same number of columns to be hit, but without overhead trusses, losses and delays by these unusual accidents would presumably be less serious. In yards it has commonly been assumed that overhead construction for the d.c. system is necessary. It has not yet, we believe, been fully worked out, but a certain amount of this overhead work will apparently be needed in complicated yards where electric locomotives are used, although not necessary with multiple unit trains only. There are surely more derailments in yards than on equal mileage of main line, so that this necessity—if it proves to be a necessity—for overhead trusses for the d.c. system in the yards tends by so much to even up the comparative dangers. It is worth while to refer again to the record, published in the *Railroad Gazette*, for May 12, 1905, page 475, of safe high-speed trolley schedules. The conditions vary somewhat from those which will prevail on electrified steam roads; nevertheless, the record is indicative.

A considerable study has been made in England and data obtained which indicate that the quantity of coal needed for a unit of transportation work is quite nearly alike for the steam locomotive and for either of the electric systems under consideration, under certain assumed conditions. Power-house coal costs less per ton than locomotive coal.

The sum of it is that the killing power of the electric current adds something to the dangers of heavy and high speed traction, although there should be some offset to this because of the elimination of smoke from yards and tunnels, but the theorists do not agree on the comparative dangers of the two electric systems; and, further, electric traction eliminates some of the dangers and most of the nuisances of the steam locomotive; but, still further, the steam locomotive will, as far as we can see in the future, be the more economical where the bulk of the transportation is done within a few hours of each day.

THE UNJUST SENIORITY RULE.

Mr. Buehring's ideas are printed in this issue, not with the notion that any officer may accept them prescriptively, but because they are suggestive.

Nothing is more obvious than the frequent injustice of the seniority rule. Not only does the service suffer from inefficient men, and from the discouraging effect of the rule on bright and energetic men whom it keeps down; the senior man himself often secures less ultimate happiness than if he had known enough to stay on the level for which he was fitted. Superintendents see the absurdity of promoting an inferior man of long service instead of the best man with a shorter time of service, and some have the courage to choose by merit, with the occasional result of being charged with favoritism. Mr. Buehring thinks that the reason for this apparent favoritism can be formulated and recorded, and, if necessary, promulgated.

He proposes a record of merits. The bane of our disciplinary records is that they deal so largely in demerits—in emphasizing what is wrong. We dogmatize to each other about the need of turning the matter around the other way and emphasizing good conduct instead of bad, but we don't make much headway in actually turning it. Every road's rules for the Brown system provide for marking merits for heroism and other unusual things, but they are unusual and have little effect on everyday practice. We must find some way to commend men oftener if we are to expect the practice to work any general benefit to the service. Mr. Buehring himself seems to be afraid of the idea, and he gives the reader little help in applying it. Those roads which write an employee a letter at the end of a year telling him that his 12 months' undisturbed record has effaced a previous record of demerits, go part way in solving the problem, and we hear nothing but praise of that system; but more is needed. Commendatory letters to men who have no sins to be washed away are good.

Mr. Buehring desires to have merits so recorded that they can be measured, and different men's records compared. In spite of its difficulties, this seems worth trying. We already weigh and compare men in our minds, and may perhaps do it better and more defensibly from the pages of a book. The objection to commending men for known merit is (1) fear that we may afterward overlook a merit or demerit, and so leave an unjust record on the book, or (2) that when we are obliged subsequently to censure we shall give the impression that the commendation has been revoked. But the remedy for this is simple if we apply Sir George Findlay's prescription for all troubles between employer and employee: "Have a good understanding." Talk with the aggrieved, and get an understanding. This takes time, but it is the rational way, and no one has devised for the railroad service any better way. The bigness of the railroads is a chief reason why discipline is less satisfactory than it was in the day of smaller things, when the real commanding officer was more nearly in touch with the men. Let us admit with equal frankness the corollary of this, that the superintendent is bound (1) to get from his manager the limit of authority of, say, 30 years ago, and (2) to keep in touch with his men. The first part of this requirement implies a campaign; but may not the employees on a big road rightfully expect their 5, 10 or 20 division superintendents to be men of large size, and expect them to co-operate with each other in magnifying the importance of their offices until the general management takes the action necessary to convert them individually into vital connecting links between the owners and the workmen? And the second part, if you have a large number of men, means that you must have two or three high-grade assistants—men nearly as competent as yourself. It is a long campaign that Mr. Buehring's suggestions call for, and better salaries.

But though it would be a fine thing to know your men so well, to so enlighten them by your counsel, and to so hold their confidence that you could have the courage to promote B, a 90 per cent. man, instead of A, a 75 per cent. man, even when A is three years ahead on the list, we must admit the difficulties. Mr. Buehring stipulates that each man's record must be fairly kept, and no tyrannous superintendent allowed to do any injustice. The scheme outlined cannot be carried out in a day. For the present the tyrannical superintendent must keep his own "fair" records. Again, even the superintendent who is not a tyrant must exercise his own fallible judgment; can he ever make the records of 50 or 100 men such that they will stand scrutiny? If credits are given for efficient service as a passenger conductor or brakeman or ticket seller, men who are born polite will quickly knock out seniority. They will easily put themselves five years ahead of other men who are efficient except in suavity. Mr. Buehring assumes that all the men will measure up to a reasonable standard of courtesy. But it is not safe to so assume. There is no satisfactory standard of courtesy except the highest.

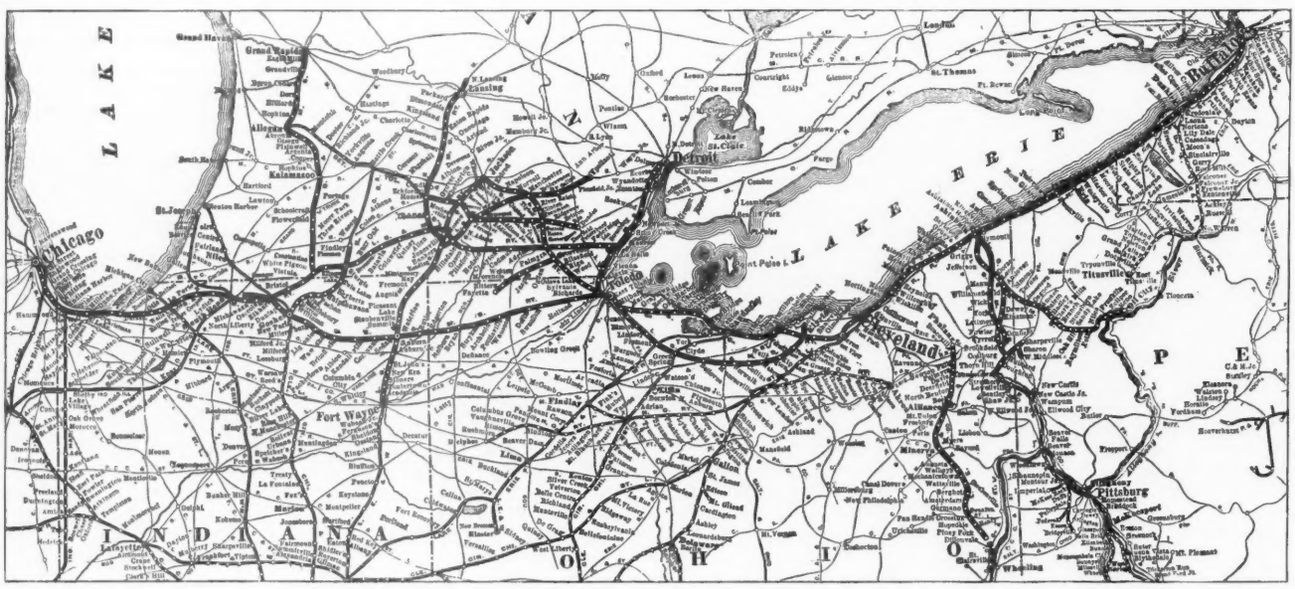
Dealing with a crew as a unit is also bothersome. The conductor and engineman who run together but do not get along well with each other cannot easily be changed around to run with more congenial men.

To praise a man only when you can praise him wholly, and under an implied bond never afterward to censure him, is like waiting to send flowers to his funeral. To put in writing these things which we have become accustomed to note and forget will at first be difficult, and will often seem absurd. After making an elab-

orate list, report or estimate, it may sometimes be necessary to throw the whole record aside and decide the case in hand by rule of thumb —that is, on grounds which you do not formulate, much less divulge. But a little trouble of this kind affords no justification for giving up. Freight traffic managers had long held that they could not formulate the reasons for raising or lowering freight rates; but Interstate Commissioner Prouty, working at $625 a month, quickly showed them how to classify thoughts and philosophize concerning reasons, even when dealing with such small matters as rates on shoe-blacking daubers c.l., X-ray apparatus n.o.s., and leather scraps k.d. Commissioner Prouty has set a good example to superintendents.

Lake Shore & Michigan Southern.

The Lake Shore & Michigan Southern is an example of an exceedingly well situated and prosperous railroad which is controlled by another company and, owing to this control, is enabled to regularly spend very large sums out of earnings for the improvement of the road. It was in 1898 that the New York Central's purchase of majority control was made and all but a little over four of the fifty millions stock exchanged for twice its face value in 3½ per cent. collateral bonds of the New York Central. Stockholders who held aloof from this arrangement, although they have received only a small proportion of the actual earnings on the stock since that time, have fared better than those who made the exchange, for holders of the convertible bonds are getting 7 per cent. on the amount



Lake Shore & Michigan Southern.

of their old stock, while 8 per cent. is now being paid on Lake Shore stock. As against this rate of 8 per cent., which is paid both on the $45,289,200 stock held by the New York Central, and the $4,177,300 still in the hands of the public, earnings for the year ended Dec. 31, 1905, were equal to more than 23 per cent. on the entire issue of $49,466,500. Here, to a certain extent, is an example of the "freezing out" process by the company which owns majority control; but, on the other hand, the fact that so large a proportion of the stockholders were willing to make the exchange in 1898 shows that this increased value came as unexpectedly as the rest of the fortune-making rises in value of standard railroad stocks during the last decade.

The difference between the 8 per cent. paid and the much larger rates earned in recent years has either been expended on the road itself or used to increase the Lake Shore's holdings of other companies' securities. Included in expenses of operation in the report for 1905 are two items, one of $3,743,020 for new construction (addition betterments) and the other of $3,360,773 for additions to equipment—a total of $7,103,793 spent out of income for returns properly chargeable to capital. This was in addition to such liberal regular maintenance expenses as $2,875 a mile for maintenance of way, and for equipment repairs and renewals, $2,270 per locomotive, $1,006 per passenger car, and $74 per freight car. Adding together the construction expenditures for addition betterments, which amounted to $2,463 per mile, and the maintenance of way expenses, total expenditures on the line, out of income, amounted to $5,338 for each mile of main track, a very remarkable figure for any railroad.

These habitual expenditures out of income have naturally resulted in keeping down the capitalization of the company. As long ago as 1879 the road was capitalized at $74,289 per mile, including capital stock and funded debt. During the next 16 years the capitalization per mile of line was actually reduced, being in 1885, $72,735; in 1890, $66,447, and in 1895, $65,810. In 1893 the figure was $70,830, but this apparent increase was offset by the fact that refunding had lowered interest rates on bonds. At present the capitalization amounts to $50,000,000 stock (of which $533,500 is guaranteed 10 per cent. stock), and $101,324,000 bonds. The bonds are gold mortgage 3½ per cents. and gold 4 per cents.—each a $50,000,000 issue—and $1,324,000 in bonds of other roads assumed by the company, $924,000 of which, in Detroit, Monroe & Toledo 7 per cents., mature on August 1st. The company's present capitalization, then, per mile of main track is $32,895 stock and $66,660 bonds, a total of $99,555 per mile. There could hardly be a more striking way of showing how low this capitalization is for a splendid railroad like the Lake Shore with its 312 miles of second track, 129 miles of third track and 73 miles of fourth track, than by mentioning the fact that the New York, Chicago & St. Louis, its weak brother, with its total of 6.24 miles of second track, is capitalized at $60,640 stock and $38,490 bonds per mile, a total of $99,130 per mile; only $425 a mile less than the capitalization of the Lake Shore & Michigan Southern.

The Lake Shore is the great Vanderbilt holding company. During the year its holdings of the $36,300,000 outstanding stock of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) were increased from $11,224,000 to $18,752,700, and the remaining $127,400 Indiana, Illinois & Iowa stock was acquired, making the Lake Shore owner of the total issue of this road. One-half the capital stock of the Indiana Harbor Railroad, a connecting line recently completed south from the lake shore near Chicago to Danville, Ill., this year for the first time appears in the list of securities owned. It was announced last week that these two companies, the I., I. & I. and the Indiana Harbor, are to be merged under the title of the Chicago, Indiana & Southern. Besides these purchases, the Lake Shore increased its holdings of securities of various other subsidiary companies.

Naturally, from its position as the most important Vanderbilt line west of Buffalo, results for the past year shared conspicuously in the general prosperity in trunk line territory. In 1902 $30,000,000 and a year ago $35,000,000 were record figures for gross earnings. This year there were gross earnings of $38,600,000, an increase of more than $3,400,000 over 1904. Of this increase, $2,800,000 was contributed by the freight earnings, largely due to the unusually heavy westbound movement of merchandise and by a total increase of 4,152,736 tons in "products of mines" tonnage, principally in ores. Regular expenses of operation increased $2,600,000, and addition betterments $1,546,500 more; a total of over $4,000,000 increase in expenses of operation. The larger amounts spent on addition betterments make the nominal net earnings a decrease of $700,000 from the preceding year. In reality net earnings showed an increase of over $800,000. Fixed charges increased $230,000, due to the sale of additional gold bonds during the year and to increased payments on account of leased lines; but income from investments covered this three times over, with an increase of $947,693. After all payments, including dividends, there was a surplus for the year of $510,600, from which $279,700 was written off to cover sundry uncollectable charges, discounts on bonds sold, etc., leaving a balance of $230,900 to be added to the profit and loss balance of the previous year, raising it to $17,118,973. In reality the resultant figures of

the income account are purely arbitrary, as they depend entirely upon the amounts spent for addition betterments, etc.—outlays which no ordinary railroad would include in its income showing.

Passenger earnings were $7,675,938, an increase of $436,042 over 1904. This does not include mail and express earnings, which amounted to $3,317,864, an increase of $120,643 over the previous year. The sum of passenger, mail and express earnings was $10,993,802, or $7,231 per mile, $10 per mile more than the sum of all earnings on such a road as the Chicago, Milwaukee & St. Paul last year. The size of the mail and express business shows clearly enough the importance of the Lake Shore as a link in the country's transportation system, and the extent to which fast mail and express are routed over this line. There were 6,545,616 passengers carried and 369,901,000 carried one mile. This is an increase of 21,503,851 passenger miles over the preceding year. The average passenger was carried 56½ miles and the average train carried 53 passengers.

There were 35,181,074 tons of freight carried, an increase of 6,126,779 tons. The ton miles were 5,382,839,643, an increase of 562,527,979, which is certainly a striking figure of gain. The ton-mile rate was 0.520 cent, a decrease of 0.002 cent from the preceding year. Earnings per freight train mile were $3.22 and per mile of road $17,752, an increase of $1,116 in freight earnings per mile of road. The passenger density was 243,300 passengers one mile per mile of road and the freight density 3,540,527 tons one mile per mile of road.

Of the total of 32,314,514 tons of revenue freight carried, the largest single items are: Grain, 1,886,214 tons; live stock, dressed meat and other packing house products, 748,593 tons; anthracite coal, 1,217,820; bituminous coal, 6,970,313; coke, 1,034,859; ores, 4,919,489; stone, sand, etc., 4,795,173; bar and sheet metal, 1,129,709; other manufactures, 1,982,931, and miscellaneous, 1,279,961 tons. The combined tonnage of manufactures and miscellaneous commodities was 8,098,692 tons. In view of this substantial proportion of high-grade tonnage (25 per cent.), it is very remarkable to find so large a train load as the Lake Shore is able to show. For the past year the revenue train load was 620 tons and, including company freight, 654 tons, the former an increase of 31 and the latter of 37 tons over the previous year. This showing is highly significant when we consider that out of a total of 1,520 miles, 980 miles are not main line, and that the past year's increase has been accomplished along with a largely increased movement of high grade freight.

The gains in earnings were reflected in increased maintenance expenditures. Maintenance of way cost $2,875 a mile against $2,159 in 1904, an increase of $716 a mile. Repairs of locomotives per locomotive were $2,270, an increase of $116 over 1904. Repairs of passenger cars ($1,006) increased $191 over 1904. Repairs of freight cars is the only item which shows a decrease, being $74 per car against $76 in 1904. The expenditure of $3,360,000 for additions to equipment appearing in income account was independent of charges to maintenance for renewals, on which there was spent $396,954 for locomotives and $845,689 for freight cars. Figures for renewals are included in the item "repairs" used in obtaining the unit charges for maintenance of equipment.

During the present year the four-tracking of the road is being continued and further extensive improvements made, the eventual plan being undoubtedly to have a four-tracked road from Buffalo to Chicago. The splendid condition of the road and the efficiency of its operation as illustrated in the train load figures are exceptional, especially in view of the fact that they have been accomplished with such low capitalization. The Lake Shore as it stands to-day is a wonderfully valuable and efficient property and forms one of the chief assets of the New York Central system of railroads.

The principal statistics of operation follow:

	1905.	1904.
Mileage worked	1,520	1,454
Freight earnings	$26,989,655	$24,185,294
Passenger earnings	7,675,938	7,239,896
Express earnings	1,032,058	920,646
Mail earnings	2,285,807	2,276,575
Gross earnings	38,600,810	35,161,053
Maint. way and structures	4,369,542	3,281,901
Maint. of equipment	4,944,965	4,340,250
Conducting transportation	14,292,416	13,482,788
Operating expenses	24,227,715	21,627,046
Addition betterments	7,103,794	5,557,281
Total expenses	31,331,508	27,184,281
Net earnings	7,269,302	7,976,772
Gross income	10,787,965	10,547,742
Net income	4,467,965	4,457,742

Missouri Pacific.

It has been generally known that the Missouri Pacific was unfortunate during the past year and stockholders have consequently awaited with interest a full detailed report covering the fiscal and calendar year 1905. Instead of such an informing document, the company has recently issued a four-page pamphlet, which contains separate statements for the two six-month periods in the year. These show only the totals of gross earnings, operating expenses, net earnings, other income, fixed charges, sundry charges, dividends and surplus. No corresponding figures for the previous year are given, which makes comparisons inconvenient. There are condensed balance sheets of the Missouri Pacific and of the St. Louis, Iron Mountain & Southern; the rest of the space being taken up with a summary of the physical conditions that worked against the road, which included floods, yellow fever and a shortage of the cotton crop, a paragraph devoted to the new Thebes bridge, and the announcement of a change in the fiscal year, which is in future to end on June 30 instead of on December 31. This does not explain why the company did not do as other companies in the same situation have done; that is, issue in the spring a full annual report covering the whole year ended December 31, and later an equally detailed report for the six months ended June 30. It is hard to explain the policy in thus withholding from the shareholders, for six months' information which is of vital interest to them and which, of course, is in the hands of the management. Further, if the announcement is to be taken literally, stockholders will never get detailed figures for the six months ended June 30, 1905, since the President says: "Hereafter the annual reports of the company for distribution to the stockholders will cover fiscal years ending June 30."

The regular annual reports of the Missouri Pacific, although bulky documents, are considerably open to criticism because of their involved character and particularly because operating expenses are not listed under the customary headings so that results are not susceptible of comparison with other railroads. In this case, such detailed criticism is impossible on account of the meagreness of the information vouchsafed in the recently issued statement. Operating expenses here are not even shown under any separate accounts whatever. Considering the report merely as the barest sort of a summary of totals, it seems worth mentioning that on its face the statements for the two half years show a total surplus after dividends of $1,927,228, whereas in reality the road failed by $18,207 to earn the 5 per cent. paid during the year on its capital stock. In other words, in the account as shown there was charged against the year's income only $1,945,435 instead of double that sum, or $3,890,870, the actual annual dividend requirement at the 5 per cent. rate.

By adding together the figures given for the two six-month periods, we are able, with the 1904 report at hand, to make the following comparison, which sums up all the information concerning the operation of the company which the recent statement gives:

	1905.	1904.
Mileage operated	6,237	6,234
Gross earnings	$42,518,272	$43,693,617
Operating expenses	30,177,727	30,406,041
Net earnings	$12,340,545	$13,287,576
Taxes	1,123,256	1,298,771
Net operating income	$11,217,289	$11,988,805
Sundry charges	1,100,907	1,282,337
	$10,116,382	$10,706,468
Other income	2,439,376	2,937,274
	$12,555,758	$13,643,742
Fixed charges and rentals	8,683,096	7,718,108
Surplus*	$3,872,662	$5,925,634
Dividends	1,945,435	3,890,868
Surplus	$1,927,228	$2,034,766

*Applicable to dividends.

NEW PUBLICATIONS.

Steam Turbines. By Carl C. Thomas, Professor Marine Engineering, Cornell University. Published by John Wiley & Sons. 281 pages.

This volume gives in logical order the fundamental principles of steam-turbine design. It discusses the action of steam or turbine buckets, the thermodynamic principles involved in the flow of steam, and the effect upon velocity of friction resistance. It includes graphical representations of work done in heat transformation, calculations of velocity and weight of flow, an account of experiments on the flow of steam and excellent descriptions of the impulse turbine, and of the impulse and reaction turbine. The Curtiss turbine is shown as a type of the first and the Parsons of the second class. The last chapters describe various other types of turbines, their operation, and their application to various work. The text throughout is clearly written and the illustrations excellent. The mathematical work is nowhere obtrusive and the significance of all important equations is enforced by means of well chosen numerical illustrations. A feature of the book also is the array of experimental data drawn from many sources. While the volume is evidently planned for class-room instruction, it will go far in satisfying all who are interested in the problems of the turbine. It is readable, even for the layman, and yet is sufficiently complete to serve well the purposes of the designer.

TRADE CATALOGUES.

Electric Traveling Cranes.—A well illustrated 19-page catalogue bearing the title "Outdoor Cranes" is being distributed by the Niles-Bement-Pond Co., New York. Illustrations of electric cranes of various types are shown in actual use, ranging in capacities from five tons to 40 tons. Among these is a 65-ft. span, 10-ton crane installed in the storage yard of the American Car & Foundry Co.

at Detroit, Mich; a 51-ft. span, 40-ton crane in the freight yards of the New York Central at Buffalo, and an eight-ton, 32-ft. radius, three-motor electric pillar jib crane for the Continuous Rail Joint Company's Troy Works.

Graphite Paint.—The Detroit Graphite Manufacturing Company, Detroit, Mich., has published a neat little pamphlet on "The Best Way to Prevent Rust." The chemical action resulting in the formation of rust is explained in a popular manner and cases are cited showing its disastrous effects on insufficiently protected steel or iron structures. The pamphlet is illustrated with half-tones of buildings and bridges painted with Superior graphite paint, made by this company.

Coal Handling Machinery.—The C. W. Hunt Company, New York, is distributing a 60-page catalogue of their coal handling machinery. The company installs complete plants and this catalogue gives descriptions of towers, booms, elevators, steam shovels and hoisting engines, as well as narrow gage railroads for piers and shops. It also describes conveyors, chutes and various minor supplies. It is well illustrated with drawings and half-tones.

Sprinkling Car.—The Brill Centrifugal Sprinkling Car is described in a pamphlet published by the J. G. Brill Company, Philadelphia, Pa. Instead of applying pressure inside the water tank, a centrifugal pump, driven by a 500-volt, direct-connected motor, expels the water through the sprinkling heads, of which there are four. The apparatus is simple and will sprinkle the road for 50 ft. on each side of the track.

Panel-Back Seats.—A little pamphlet entitled "Prejudice and Progress in Railway Car Seating" illustrates and describes the advantages of the panel-back or "fit-the-back" feature of the Richards Chair-Panel Co., Chicago. Parlor car chairs, reclining chairs, office and dining room chairs are shown; also a new design of double seat for day coaches, first used on the new "Alton Limited."

Coaling Stations, Cinder and Sand Bins and Water Tanks.—A circular just issued by Roberts & Schaefer Co., Chicago, shows half-tone views of locomotive coaling stations built by this company; also reinforced concrete cinder bins, sand bins and water tanks.

Cement Making.—The Allis-Chalmers Company's, Milwaukee, Wis., catalogue No. 129 is devoted to cement making machinery. Both the dry and wet processes are described and the rock-crushers, mills, rotary kilns and other apparatus used are illustrated.

CONTRIBUTIONS

Electric Systems for Heavy Railroad Service.

To the Editor of the Railroad Gazette:

Upon my return from a trip over the line I have just glanced over the issue of the *Railroad Gazette* of March 30 and note with some concern your editorial on "Electric Systems for Heavy Railroad Service." For instance, you apparently infer that my remarks on the possibility of increase of revenue from change of motive power applied to express service. What I had in mind is exactly the business to which you refer as an exception, viz., suburban and other local trains. In other words, if from other reasons than an increase of revenue it is necessary on a steam railroad to change the motive power from steam to electricity, involving the use of electric locomotives to pull non-electric cars from remote points, is it not at the same time wise to adopt a type of self-contained electric suburban equipment which can be operated by the multiple unit system in such a way as to adapt the size of frequent units to the volume of business at different portions of the day? Certainly in the case of this company a careful analysis of the situation proved conclusively to my mind and to those associated with me in making the change of motive power, that as long as the change had to be made anyway for long haul traffic, electricity should be so applied to the short haul traffic as to give to the public, and therefore to the railroad corporation, all of the well-known benefits that come with the use of electricity in interurban traffic.

As to my being in conflict with myself in prophesying the comparative safety of third rail and overhead construction, I must confess that I cannot quite see where I have been guilty of this unpardonable offense. While I do admit that under certain conditions the third rail conductor may offer dangers (and for that matter what system of railroading does not offer some kind of a danger?) still I am firmly of the belief that the third rail conductor is the safest type at the present development of the art, and that it is a "well tried apparatus that has passed beyond the experimental stage." The third rail that we propose to adopt has been in actual use near Schenectady, both experimentally and otherwise, for nearly a year under the most severe conditions in temperature changes, snow and sleet storms, and actual operation of both steam and electric equipment. I hope that you will corroborate this statement.

As to the third rail having dangers that have been proven by many ghastly catastrophies, I must confess that I am in ignorance on this point. It is true that I know of a few fatal accidents on, for instance, the Manhattan Elevated Railroad due to carelessness of workmen around an unprotected third rail, but on the other hand I know of equally fatal accidents, not to workmen but to the innocent public on, for instance, the Indianapolis alternating current overhead construction. There has been much said about the "dangerous third rail," but I have been unable to find any instances in this country of accidents, even with the usual unprotected or partially protected types, except to workmen or trespassers. The N. Y. C. & H. R. R. R. type is expected to guard against even accidents of that kind.

I am very anxious not to take any attitude as a partisan in favor of either the third rail or the overhead construction, but I feel that so much has been printed about third rail that from my standpoint seems to be unfair as compared with overhead construction, that it should be made plain by those who are obliged to use both that after all the third rail is not as bad as it has been represented, and that later developments have shown that it may be protected so as to be almost innocuous.

As to knocking down overhead construction, I feel that this is not a mere theory. In my personal experience on western lines I know of at least five through pin-connected bridges that were knocked down on one railroad, and I have known of two instances on the lines of this company within the past few years where derailed trains have collided with through trusses, and we have also had several signal bridges knocked down, including a signal tower. With overhead trusses having supports every 300 ft. on a four-track railroad it seems to me that the chances are multiplied for serious results from derailments knocking down these supports so as to affect not only the track upon which the derailment occurs, but all four tracks, and that this danger is still further magnified by the carrying of extremely high voltages directly over the moving equipment. You may perhaps have noticed recently in the press that we are having difficulty with the Department of Water Supply, Gas and Electricity to secure the rights to string aerial transmission lines carrying 11,000 volts within the city limits in the upper part of the Borough of the Bronx, entirely upon our own private right-of-way and upon steel poles with concrete bases on the side of the tracks and not over them.

W. J. Wilgus,
Vice-President, N. Y. C. & H. R. R. R.

Per Diem 25 Cents.

The proposed increase in the rate for the use of interchanged freight cars has been approved and it will go into effect July 1, four years from the date of the adoption of the per diem principle. Secretary W. F. Allen, of the American Railway Association, announces that the rate (25 cents a day instead of 20 cents) has been adopted by a vote of 221 members (1,640,460 cars) against 68 members (114,582 cars). The corresponding reduction of the penalty rate from 80 cents to 75 cents was adopted by a vote of 226 members (1,717,064 cars) against 61 members (131,761 cars). The proposition to reduce the penalty against companies having over 2,000 miles of road was lost, 147 members (885,425 cars) voted in favor of it, and 135 members (969,150 cars) against. The New York Central and the Pennsylvania voted in the negative. The revised form of penalty notice was adopted. The membership of the association is 304; cars owned or controlled, 1,874,100.

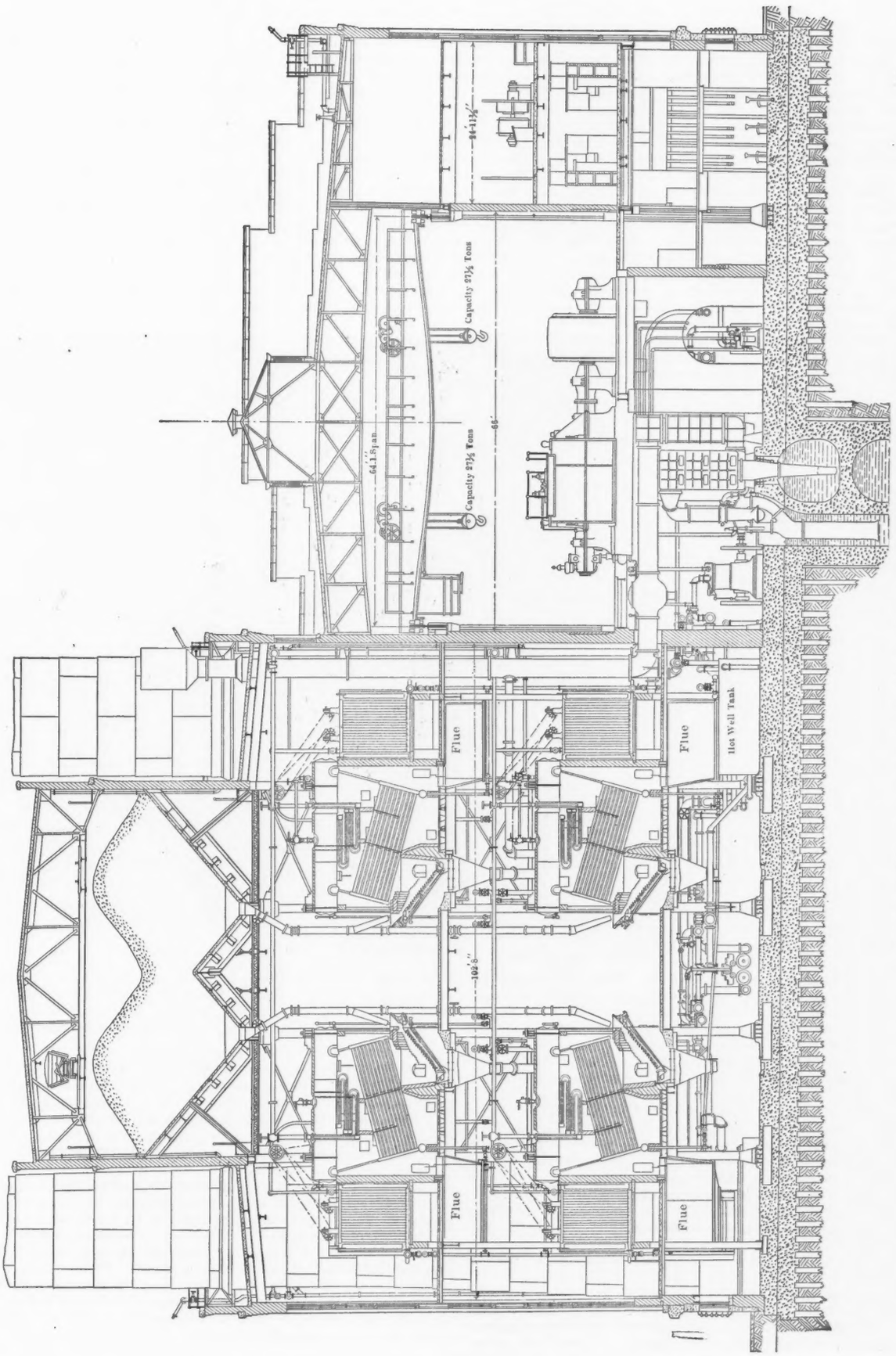
The Pennsylvania Railroad's Extension to New York and Long Island.

(*Concluded from page 352.*)

GENERAL FEATURES OF POWER STATION EQUIPMENT.

A description of the steam plant should be prefaced by an outline of the general system on which it is laid out. The desirability of subdivision into units or groups of units always appeals strongly to the operating force in a large steam plant, which must always be ready for emergencies no matter how perfect the design of the plant may be. The necessity which may arise at any moment for cutting out a portion of the plant makes it desirable to design it in the first place with a view to easy and economical subdivision, so that when completed a large power plant may be regarded as a collection of self-contained individual plants, all located under one roof and under one control, but capable of being readily separated. When, as is usually the case, they are joined up and operated as one plant, the lines of separation between the sections are practically obliterated.

The unit system of design was followed in laying out the



Sectional Elevation of the Long Island City Power Station of the Pennsylvania.

equipment of the power station. The boiler plant of 32 boilers is divided into eight groups of four boilers each, four of these groups being on the first floor, and four directly over them on the second floor of the boiler house. The four boilers of each group stand opposite each other across an alley or firing space, and are separate as regards economizer, flue and stack connections, but their steam connections are made up so as to form them into a group for the purpose of unit subdivision. That is to say, the four boilers at the west end of the plant on the first floor, on both sides of the alley, are piped to one manifold, which is connected to a vertical header, and the four boilers directly above them on the second floor are piped in the same manner to the same header, the two groups of four constituting the first unit group at the west end of the boiler room. This group is amply sufficient to furnish steam to the two 2,500-k.w. lighting units, which will eventually constitute the first unit subdivision at the west end of the engine room. The second groups of four boilers on the first and second floors are piped together in like manner so that they can, as one group, supply steam to the first 5,500-k.w. turbo generator. These main groups of boilers are piped together by a cross-connecting header which is to be considered as an equalizer, rather than as a large main into which all boilers feed and from which all engines take steam, which is the most usual layout of power station steam piping. Although this subdivision into unit plants may or may not be availed of by the operating force, it nevertheless constitutes a systematic and uniform scheme of development, favoring the duplication of the bends, valves and other pipe details, thereby rendering construction economical.

STEAM GENERATING PLANT.

The boiler plant for the Long Island power station consists of 32 Babcock & Wilcox water tube boilers set in batteries of two boilers each, eight batteries on the first floor and eight on the second floor immediately over the former; these batteries are equally distributed on each side of the boiler plant, with a firing space between boiler fronts of about 18 ft. in width.

The boilers are designed for a working pressure of 200 lbs. per square inch, and each boiler has a total effective water heating surface of 5,243 sq. ft., comprised in three steam drums 42 in. in diameter and 23 ft. 10⅝ in. long, and 21 sections of 4-in. tubes 18 ft. long with 12 tubes in each section. The general arrangement of the entire boiler plant and accessory apparatus is shown in the sectional elevation.

Besides the water heating surface each boiler is supplied with an internal superheater consisting of two sections of tubing arranged much like a letter U lying on its side. These superheaters are shown in position in the sectional view of the power station. Each superheater is capable of superheating the output of the boiler 200 degs. Fahr. when operating at 200 lbs. pressure, and comprises about 1,116 sq. ft. of superheating surface.

The sections and drums composing the boilers are hung from wrought-iron beams framed into the building columns, and suspended entirely independent of the brickwork in such a manner that the brick setting is not affected by the expansion and contraction. Each battery occupies a rectangular space 23 ft. 5 in. long by 30 ft. 6 in. wide. The headers, drum heads, manhole plates and cross connections are hydraulically forged from open-hearth steel. The tubes are of lap-welded charcoal iron, expanded into reamed holes in the forged steel headers. The longitudinal seams of the boiler drums are butt-strapped inside and outside, and circular seams are double riveted. All pressure parts are tested and made tight at 300 lbs. hydrostatic pressure after erection.

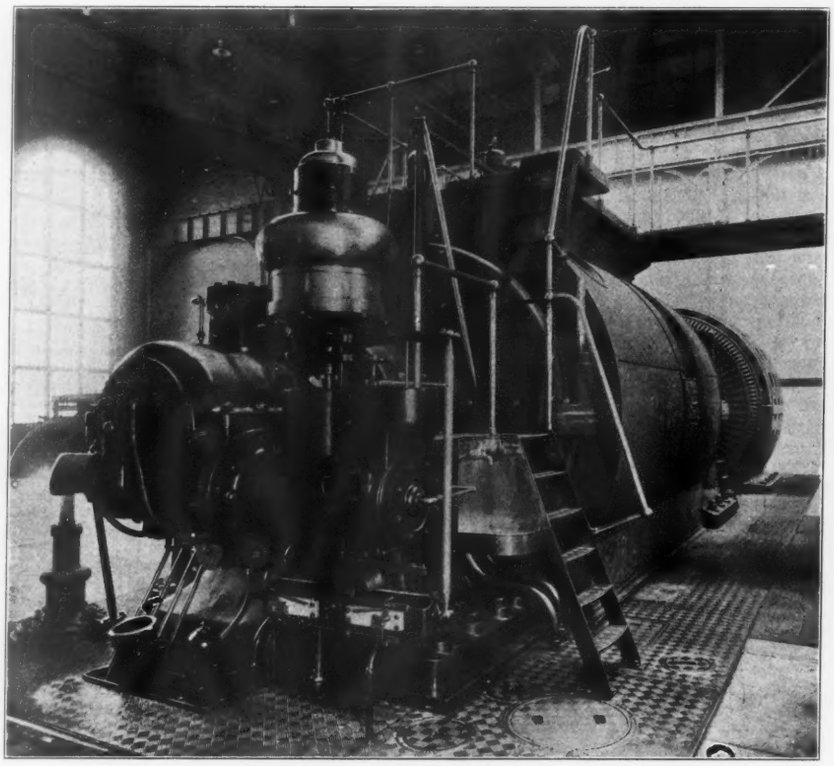
Provision is made for flooding the superheater when it is out of service. Each boiler is fitted with three 4-in. safety valves. Each boiler has two steam openings, the main nozzle receiving steam from the superheater and the auxiliary nozzle taking its saturated steam directly out of the tops of the boiler drums for use in the auxiliary mains that supply the small engines in various parts of the house.

The 32 boilers now installed are arranged in four groups with eight boilers in each group, the eight boilers being those on the first and second floors directly over one another. The group nearest the west end of the plant is intended ultimately to take care of the two 2,500-k.w. lighting units there to be installed. The other three groups are each capable of supplying one 5,500-k.w. turbine unit. The ultimate capacity of the boiler house, when finally extended, will be 96 boilers of the type now installed. Each boiler is fitted with a Roney stoker.

The disposition of the hot gases after leaving the boilers is of particular interest. The arrangement of flues, economizers and dampers has been made so as to permit the operation of the plant on the unit system (that is, by working each set of eight boilers on one turbine), but at the same time certain features of interchangeability are incorporated, so that the flues and economizers can be interchanged and cross-connected to insure the greatest capacity and highest efficiency under all conditions of operation, even though some portions of the boiler and economizer plant may be out of service. One economizer utilizes the waste heat from two batteries of boilers.

The boiler flues are of sheet steel, and are underneath the floor on which the boilers are situated. The economizers are directly behind the boilers and over the flues. Each economizer consists of 56 sections of 10 tubes each, designed for 250 lbs. pressure. The sections are designed with a special system of connections for circulating the water through them. The soot scrapers on the economizer tubes are driven by four small Westinghouse Standard engines.

The rear wall of the economizer chamber is made of vitrified asbestos air cell board, laid on in sections, so that in the event of a broken economizer tube it is not necessary to tear down any of the brick work in order to replace the section. The economizers are provided with 6-in. headers, which is a larger size than usual, and each section is provided with a separate blow off for cleaning.



Steam End of 5500-K.W. Turbo Generator.

STEAM TURBINES.

For the initial equipment three main generating units have been installed, consisting of steam turbines direct connected to three-phase 11,000-volt generators of the revolving field type. The turbines are of the Westinghouse-Parsons single-flow type, rated to develop 5,500 k.w. at 175 lbs. steam pressure, and 27½ in. vacuum, running at 750 r.p.m. A general view of the three turbine units in the engine room is shown.

A separate condenser is provided for each turbine of the counter-current surface type, built by the Alberger Condenser Co., and having 20,000 sq. ft. of cooling surface, consisting of seamless drawn brass tubes of No. 18 S. W. G., and 1 in. outside diameter.

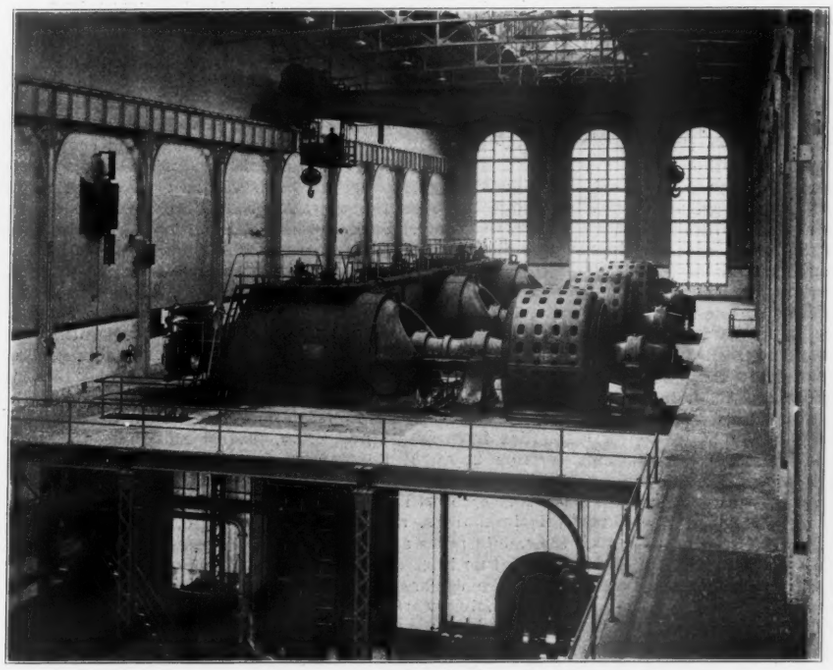
The condenser is placed in a large arched opening made in the turbine foundation. There is thus a marked saving in space made possible by the horizontal type of turbine, for it enables the entire condensing plant, consisting of condenser, circulating pump, dry air pump and hot well pump to be compactly grouped within and about the base of the foundation.

ELECTRICAL EQUIPMENT.

Since the standardization of the steam turbine as a prime mover, a distinct type of electric generator has been designed to

conform to the new speed condition imposed by the turbine. In a way, it is a reversion toward the earlier types of high-speed generator. The difference between the size and weight of a 5,500-k.w. turbo-generator and one of the slow speed engine type is no less marked than the difference between the two types of prime mover. The "engine" type of generator runs from 60 to 75 r.p.m., while the turbo type, so-called, running at 750 r.p.m., can be designed with far greater economy both of floor space and material—conditions which readily lend themselves to the greatest possible simplicity of design.

The stationary armature, enclosed in a large cylindrical yoke of cast-iron, consists of a ring-shaped core built up of overlapping punchings of soft sheet steel with the interior surface slotted to receive the winding, having ventilating strips inserted at suitable intervals to form passages for the free circulation of air through the core and winding. The coils are wound with copper wire, and as is usual with very large generators, the coils were built into the slots after the armature frames and cores were permanently in position on the bedplates. The coils are securely held in the slots by retaining wedges of hard fiber, fitted into grooves formed in the armature teeth. The ends of the coils where they project beyond the ends of the laminated core, are protected by large perforated cast-iron flanges, completely enclosing the opposite ends of the armature. The machines are "star-wound," i.e., the three sets of armature coils, needed for the generation of three-phase alternating current, are all connected to one point called the "neutral," and the neutral points of the three machines are connected to one neutral bus, which is permanently grounded through a resistance.



Interior of Engine House Showing Three 5500-K.W. Units.

The revolving field consists of a four-pole structure formed out of solid steel disks milled to receive the winding. It is 6 ft. 8¼ in. in diameter, and about 6 ft. long. The field coils are wound with heavy copper straps embedded in slots and retained by heavy bronze wedges. Ventilating ducts are provided in the core, which enables the revolving field to draw an abundant supply of air through its interior by a sort of fanning motion, which also aids in reducing the temperature of the stationary armature.

The core is pressed on and keyed to a shaft of nickel-steel 19¾ in. in diameter, and running in bearings 15 in. in diameter, through which there is a forced circulation of oil. The field is separately excited at 220 volts, the exciting current being delivered to the winding through a two-ring collector by means of sliding carbon brushes.

These generators are each guaranteed to deliver 289 amperes per terminal at 11,000 volts, and 80 to 100 per cent. power factor for a space of 24 hours continuously, with a rise in temperature not to exceed 35 deg. C., and a 50 per cent. greater current for two hours with a rise not exceeding 55 deg. C.

EXCITERS.

Three separate sources are provided for exciting the fields of the main generators, viz., the two steam-driven exciters, one motor-driven exciter, and a storage battery. These are designed to give direct current at from 180 to 220 volts. The steam-driven engine units each consist of a Westinghouse-Parsons steam turbine directly coupled to a 200-k.w. direct-current turbo-generator, designed to run at 1,800 r.p.m.

These turbines are of the same general type as the main units and are designed to run either condensing or non-condensing, with 175 lbs. steam pressure and superheat up to 200 deg. Besides a connection to the superheated steam supply they are also connected to the auxiliary steam main that supplies saturated steam. They are arranged so that they can be exhausted into one of the large condensers, or when running non-condensing, into the auxiliary exhaust mains, passing the exhaust steam either to the feed water heaters or to a separate outboard exhaust riser.

The exciters are located near the southwest corner of the main floor.

The motor-driven exciter, also of 200-k.w. capacity, is driven by a 290-h.p., three-phase, 440-volt induction motor, both motor and generator being mounted on the same shaft, bearings and bedplate. This motor-driven exciter is located in the operating gallery. The three-phase motor derives its current from three 175-k.w. oil-insulated self-cooling transformers located in the basement of the electrical gallery.

The storage battery is intended mainly as an absolutely reliable source of supply of the exciter bus system and the other more important auxiliaries. It is installed in a specially arranged room in the engine room basement and consists of 110 cells, each containing seven plates of the type "R" chloride accumulator manufactured by the Electric Storage Battery Company. The tanks are built large enough to ultimately contain 11 plates. This battery has a discharge rate of 36 amperes for one hour, and is controlled from the operating gallery. It is normally kept floating across the excitation bus. In order to charge the battery a 12.5-k.w. booster driven by a 15-h.p. induction motor is located in the operating gallery next to the motor-driven exciter above mentioned.

CONCLUSION.

The first work of clearing the site began on Sept. 15, 1903, and the excavation on Oct. 20. The first turbine was started Jan. 16, 1905; high tension current was first turned into the transmission line April 27, 1905. Current was furnished for testing cars on May 13, and on July 26, 1905, the line between Flatbusn Terminal and Rockaway Park, the first section of the Long Island Railroad to use the new motive power, was permanently changed from steam to electrical operation.

The station was planned and built by Westinghouse, Church, Kerr & Co., Engineers for the Pennsylvania, New York & Long Island, which is the organization through which the Pennsylvania is carrying on its New York extension work. The design and construction were under the charge of George Gibbs, Chief Engineer of Electric Traction of the road, and under the general supervision of the Mechanical and Electrical Advisory Committee, New York Extension, a committee composed of officers of the Pennsylvania Railroad.

The Anthracite Coal Strike of 1902.

BY FRANK JULIAN WARNE.

The memorable strike of the anthracite mine workers in 1902 was a natural consequence of the incomplete and unsatisfactory settlement—unsatisfactory alike to both sides—which political expediency, interpreted by the leaders of the national Republican party, forced upon the country in terminating the strike of 1900. The 1900 contest had been inaugurated on September 17 of that year under nine or more specific and well defined grievances or demands on the part of the mine employees, all of which the operators had at first refused, but which were compromised before the strike had completed its sixth week through fear that a continuance of the industrial disturbance up to the Presidential election in November would jeopardize the prospects of the candidate of the Republican party. The settlement of the 1900 strike being a compromise, many of the issues raised by the United Mine Workers of America were naturally left in a very unsatisfactory state, and for the 18 months following there was continual unrest and industrial disturbance throughout the entire anthracite region, marked by innumerable petty strikes with now and then a more serious suspension of coal mining.

As an outgrowth of this situation and also as a result of the failure of representatives of the United Mine Workers to secure a

joint conference with representatives of the operators for the purpose of discussing and agreeing upon some method for an adjustment of the issues, the great strike of 1902 was on May 12 inaugurated. Before this date the mining companies had posted notices at their collieries announcing that "The rates of wages now in effect will be continued until April 1, 1903, and thereafter subject to 60 days' notice. Local differences will, as heretofore, be adjusted with our employees at the respective collieries." Notwithstanding, on the day the strike order became effective, practically every mine in the entire region became non-productive and continued so for the greater part of the following six months, almost the entire 140,000 mine employees remaining idle for all of that time. Mining operations were resumed on October 23.

The specific demands embodied in the wage scale of the Shamokin convention, which determined upon suspension, were for an increase in wages of 20 per cent. to miners paid by the ton, a reduction of 20 per cent. in the hours of work each day by per diem employees, and that 2,240 lbs. constitute the ton on which payment should be based for all coal mined where miners were paid by weight. This last demand was to apply in any district where it was practicable to weigh coal, and to all miners paid by the quantity and not by the day. A fourth demand, which towards the close of the struggle really became the most important of all, inasmuch as it practically included all the demands, was that for arbitration of the issues.

On the first day the employees remained away from the collieries in response to the strike order in May, 1902, the machinery of the organization adaptable to strike conditions became operative. Pickets were stationed about the colliery grounds to prevent mine workers and non-union men, usually brought into the region from the eastern seaboard cities, from going to work. Usually the "imports," as the men from outside the region were called, arrived under guard, or secretly at night, but very few escaped the vigilance of the strikers, the result being disturbances of the peace and in cases small-sized riots. Once within the well-guarded grounds of the mining company the strike-breakers were usually safe beyond the reach of the strikers. Whenever workers were encountered by the pickets, if persuasion failed to keep them out of the collieries, recourse was not infrequently had to force, which took the form of duckings in creeks or rivers, marching of non-union men along the public highways to their homes in scanty attire, whitewashing of some, stoning and assaulting of others, and visitation upon workers of other forms of punishment devised by the ingenuity of the mob. So great was this interference with those who continued at work that by June the companies had turned their collieries into armed barricades or stockades, with newly built or repaired houses for the accommodation of the workers, the whole grounds in not a few cases being surrounded by a high wooden fence topped with four or five strands of barbed wire.

With such forces as boycotting, ostracism, picketing and the like in operation throughout the entire region it is little to be wondered at that peace and order were disturbed. Aroused human passion and embittered class hatred were given a loose rein; public sentiment, which should have held a check upon these enemies to organized society, seemed only to urge them upon their devastating course, since the great majority of the inhabitants of the coal fields strongly favored the cause of the men on strike. Despite responses of sheriffs of different counties to appeals of the operators for protection; despite the large increase in the number of officers and coal and iron policemen to preserve order, and in face of frequent proclaiming of the riot act and threats to call for troops, the machinery of local government in the coal region was interfered with and made almost useless by public sentiment, called by some the "tyranny of the majority" which not only secretly but openly supported the strikers' acts, even to violation of law. Thus justice not infrequently miscarried at the hands of juries summoned to try offending strikers who were more often than not composed of mine workers and their sympathizers. The sworn officers of the law, in their endeavors to perform their duties, were as dry leaves before an autumn storm. As early as July 10 the sheriff of Carbon County had called upon the Governor of Pennsylvania for troops, but this request was refused, the chief executive believing that the county officials had not exhausted all their powers for preserving the peace. Disorders in the various sections grew apace as the strike dragged on towards its third month. On July 29, following a riot at Shenandoah in which one man was killed and 40 and more shot, which was precipitated by an attack upon a deputy sheriff who was escorting non-union men from one of the collieries, the Eighth and Twelfth Regiments, the Governor's troop, and two companies of the Fourth Regiment, all of the Pennsylvania National Guard, were stationed in Schuylkill County. A month later they were joined by the Second Troop Philadelphia City Cavalry.

About the middle of September, after the strike had continued four months without any indication that the mine workers would soon return to their places in the collieries, the operators determined to bring the already costly struggle to a close by attempting to resume the mining of coal with non-union men. Efforts were made by the superintendents and other officials through personal interviews, by posted notices about the company grounds, in promises that "foremen will not make known the names of those applying for work," and in other ways to induce the miners in particular to return to their old places. This activity of the operators was accompanied by renewed efforts on the part of the strikers to keep the mines closed and all workers away from the collieries until the operators granted their demands or at least submitted the issues to arbitration. Railroad tracks extending into the colliery grounds were destroyed, dams supplying the mining plants with water for steam purposes were blown up, washeries set on fire and in other ways badly wrecked, and armed attacks made upon colliery guards. Non-union men were assaulted; houses sheltering the defenceless wives and children of workers were dynamited, to some the torch was applied, and in others the furnishings wantonly wrecked; deputy sheriffs escorting men to and from work were attacked; trains bearing non-union workmen were wrecked, jails stormed, and officers of the law resisted with force. Railroad bridges were dynamited or set on fire to prevent coal being shipped out from the region, crews hauling non-union mined coal were stoned and fired upon, and attempts were even made to wreck passenger as well as coal trains.

By the beginning of October acts of lawlessness were general throughout the whole anthracite region. Seven men had been killed in conflicts between strikers on the one side and non-union workers and officers of the law on the other, three of the killed being striking mine workers, three non-union men and the other one an innocent third party. The issuing of sheriffs' proclamations in all the seven counties affected; the swearing in of hundreds of deputies, and even the ordering into the region of the Ninth and Thirteenth Regiments, the Sheridan Troop, and the remaining eight companies of the Fourth Regiment to assist the military force already in the fields, were not sufficient for the preservation of law and order as the struggle between the operators and mine workers became more and more acute. Such were the conditions in Schuylkill County that its sheriff requested of the Governor that martial law be declared throughout its borders, but this request was not granted. On October 6 all the remaining fighting strength of the entire National Guard of Pennsylvania, comprising, with those already in the field, a total of nearly 10,000 officers and men, constituting one division, was ordered into the anthracite counties. In his general order Governor Stone designated the counties in which "tumults and riots frequently occur and mob law reigns," and instructed the commanding officer to "see that all men who desire to work and their families have ample protection, protect all trains and other property from unlawful interference, arrest all persons engaging in acts of violence and intimidation and hold them under guard until their release will not endanger the public peace; see that threats, intimidations, assaults and all acts of violence cease at once; the public peace and good order are preserved upon all occasions, and that no interference whatsoever be permitted with officers and men in the discharge of their duties." Under the protection of troops escorting workers to and from the collieries, anthracite was being mined for the first time since May. The operators claimed that from 17,000 to 20,000 men were at work in mines throughout the three fields by the middle of October.

But so great a quantity of anthracite had been shut off from the market by the five months suspension that a fuel famine had set in throughout all the principal cities of the eastern seaboard and middle western states. Anthracite in domestic sizes was selling for $25 a ton and in cases for as much as $30 a ton, pea sizes for $12, and buckwheat for $6 a ton. So valuable had anthracite become that the bottoms of rivers in the three fields of production and in the vicinity of coal docks near the large cities were dredged for coal. Bituminous coal for domestic use was retailing at $9 a ton. The poor on the East Side in New York City were paying 25 cents a bucket, or 75 cents a bushel, and the prospect of suffering among this class for lack of fuel was so appalling that charitable organizations held union meetings to devise some means of grappling with the pressing problem. Everywhere the public was being compelled to have recourse to substitute fuels like oil and gas and to adopt various devices for meeting the necessities for heat in their houses.

At the beginning of October, after failure of repeated efforts to terminate the strike, the prospect of a fuel famine at the opening of the winter months had become so threatening as to overshadow all else in the public mind. Public feeling was in a highly excited state and immediately moved to the support of President Roosevelt when, in behalf of the public, he undertook a settlement of the controversy. After repeated efforts on his part to bring the operators and mine workers to an agreement, on October 14 both parties agreed to abide by the award of a commission to be appointed by the President. On October 23 the 140,000 mine workers returned to their places in the mines after an idleness extending over five months and 11 days.

The Anthracite Coal Strike Commission held sessions for the

next five months, taking testimony from 558 witnesses representing both operators and mine workers. Its report was made to President Roosevelt and to the parties to the controversy on March 18, 1903. The award increased wages for different groups of mine workers, such as contract miners, engineers and pumpmen, firemen and company men; continued the prevailing methods of payment for coal mined; provided for check weighmen or check docking bosses, or both; settled upon a uniform and equitable distribution of mine cars, and provided against the limitation of output by miners; determined the size of the mine car; established a sliding scale of wages; denied alike to operators and to mine workers exercise of the power of discrimination because of membership or non-membership in any labor organization, and regulated the payment of wages to the laborers or contract miners. In addition, the Commission made general recommendations on such vital points as the enforcement of law and protection of property, the employment of children, and the compulsory investigation of industrial disturbances. At the same time, by virtue of actual conditions existing within the anthracite industry, which it was seen would give rise to issues just as important as those passed upon by the Commission, as well as for the purpose of interpreting and carrying into effect the award of that body, it called into existence a joint committee of three operators and three mine workers, with provision for an umpire in case these six could not agree, which has become known as the Anthracite Board of Conciliation. This award of the Commission was to continue in force for three years, until March 31, 1906.

The cost of the strike, estimated by the Strike Commission, was about $100,000,000. Of this amount over $46,000,000 represented loss to the coal mining companies due to the decrease in production; $25,000,000 represented loss in wages to the mine workers, and $28,000,000 the estimated loss to the railroad companies in freight receipts through the withdrawal of coal traffic. The cost to the state of Pennsylvania for maintaining troops in the coal region was about $1,000,000, and the expense to the Federal Government for the Coal Strike Commission exceeded $50,000. The Commission's estimate of the money cost of the strike of 1902 does not take into consideration the compensating advantages to one or the other side to the struggle which made the cost of suspension much less than would at first appear. What seemed a cost to the operators or the mine workers was in cases merely a deferred payment. Take the question of production as an illustration. While it is true that probably 20,000,000 tons of anthracite would have been mined if there had been no strike, yet this amount of coal was not destroyed by the suspension nor lost absolutely to the mining companies, as the estimate would indicate. The coal merely remained in the ground unimpaired, to be mined later. But all the money cost of the strike of 1902, whether counted at first as a loss to the mining companies, the mine workers, or to the railroad companies, has long since been transferred from all of those engaged in the production and distribution of coal to the pockets of the consumer, that is, upon the shoulders of the public. This has come about through the higher price for a ton of the domestic sizes which the railroad mining companies have received since the strike. It is estimated that during the three years and six months following the close of the strike of 1902 the increase in price which consumers of hard coal have had to pay amounts to more than $30,000,000. In other words, the railroad mining companies have transferred the cost of the strike of 1902 to the consumer in higher prices for anthracite to the extent that the average householder using hard coal since the close of that struggle has paid $17.50 more for his fuel.

Details of the A. C.—D. C. Locomotives for the New York, New Haven & Hartford Railroad.*

Thirty-five electric locomotives are to be furnished by the Westinghouse Company to the New York, New Haven & Hartford, suitable for operation on its direct-current division between the Grand Central depot and Woodlawn, and on its alternating-current portion of its line between Woodlawn and Stamford. One locomotive has already been constructed and the results obtained assure the complete success of the alternating-current system.

The frame, trucks and cab of the locomotive were built by the Baldwin Locomotive Works, according to designs developed with the co-operation of the New Haven Railroad and the Westinghouse Electric & Mfg. Companies. The frame is of the rigid type with side pieces made of steel channels, to which are bolted and riveted other steel channels placed transversely, two over each truck, forming transoms for the transmission of the weight to the center-pins. These channels are placed outside the wheels and as close together and as low down as the wheels and draw-head will permit, and are braced and squared by substantial steel flooring plates which are riveted and bolted to the top flanges. The transoms are further braced by gusset plates which are riveted and bolted to the bottom flanges of both sets of channels and which transmit the tractive power from the center-pin to the side channels. The frame is still further strengthened and secured by diagonal plate braces.

As the entire space between the wheels is occupied by the motors, it was impossible to transmit the drawbar pull through the center line of the locomotive; so the entire strain is carried by the strong plate girders which make up the locomotive frame. A Westinghouse friction draft gear is mounted directly underneath the box girder at each end and is applied to two steel bumpers laid horizontally between vertical gusset plates on the ends of the side channels.

The running gear consists of two trucks, each mounted on four 62-in. driving wheels. The trucks have side frames of forged steel, to which are bolted and riveted pressed steel bolsters which carry the center plates. The weight on the journal boxes is carried by small semi-elliptic springs with auxiliary coiled springs under the ends of the equalizer bars, to assist in restoring equilibrium. A very strong construction is secured without excessive weight by the use of bolsters 30 in. wide at the center plate and extended to nearly double that width at the ends which are bolted to the side frames. Center pins 18 in. in diameter transmit the tractive effort to the frame. They are well lubricated to permit free motion on curves. The truck pedestals are provided with wedge and gib adjustments to take up wear, and the bearing brasses are easily removable by hand. The distance between the truck centers is 14 ft. 6 in.

The cab is formed of sheet steel mounted on a framework of Z bars which supports the walls and roof. Windows are provided at each end, giving an outlook on both sides and in front of the locomotive; and the driver is so close to the front that he can see the track a very few feet ahead. This advantage is not possessed by any type of steam locomotive now in service. The master controllers, auto-transformers, instruments, grid resistances, air operating valves, compressors and other auxiliary apparatus are mounted inside the cab upon an angle-iron framework which is built into the cab and securely anchored to floor and roof. A clear passageway is left through the center. Trap doors in the floor furnish easy access to the motors for inspection or repair.

The equipment of the locomotive includes four gearless motors, controlling apparatus and auxiliaries. The motors are of the compensating gearless type, designed for operation on both single-phase alternating and direct-current. They are wound for approximately 235 volts on alternating current and 275-300 volts when operated by direct current. They have normal rated outputs of 250 h.p. on the basis of ordinary railroad practice, and a continuous capacity of 200 h.p. each. The locomotive therefore has a continuous operating capacity of 800 h.p.

The motor frames are made of cast-steel and are of a circular, skeleton form. They are diyided horizontally into two parts in order to give access to the inside of the field or to the armature. A laminated core with slotted projecting poles is built up within this frame and wound with field coils of flat copper strap insulated between turns with asbestos and filled with an insulating compound which is heat-conducting and waterproof, so that a sealed coil is produced which can withstand moisture and internal heat. Copper bars are placed in slots in the pole faces and connected to form a continuous neutralizing winding which forms part of the circuit, including the main field coils, the armature coils and the auxiliary winding, all in series. This auxiliary winding produces a magnetic field which opposes and neutralizes the reaction of the armature. It is so formed that it need not be disturbed in order to remove the main field coils.

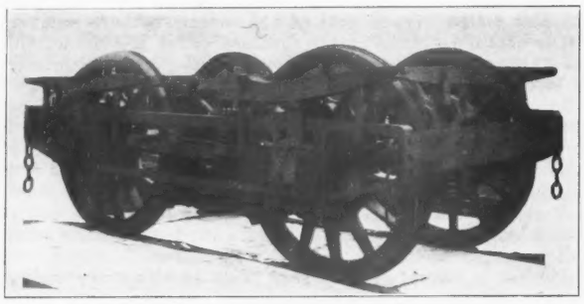
The armature core is built up of soft steel punchings which are assembled on a cast-iron spider and held in place and keyed to prevent their turning. The surface is slotted and the armature winding is arranged in three layers. The two upper layers are composed of copper strap connected to form the usual direct-current type of winding. The third layer constitutes the preventive winding. It is connected between the commutator and the main winding. This preventive winding is so proportioned as to minimize the combined loss due to the normal working current and that which is produced in the coil under commutation, when short-circuited by the brush in an alternating field. The individual coils are insulated along their entire length by overlapping layers of mica tape, and each group is further insulated from the core by a moulded mica cell. The completed winding is held firmly in position by insulating wedges. The ends are banded down against the coil supports.

The commutator is formed of copper bars clamped between V-shaped cast-steel rings and insulated by V rings and bushings of moulded mica. It is pressed on the spider which supports the armature core. The brush holders are of the sliding type with arms mounted on a rocker ring. Tension is provided with flat, phosphor bronze springs which have sufficient turns and are so mounted that friction between turns is eliminated and uniform pressure secured over a considerable range without adjustment. Each spring is held

*A general description of the New York, New Haven & Hartford's electrification plan was given in a paper by B. G. Lamme before the New York Railroad Club, March 16. A reprint of this paper was given in the *Railroad Gazette* of March 23, page 302.

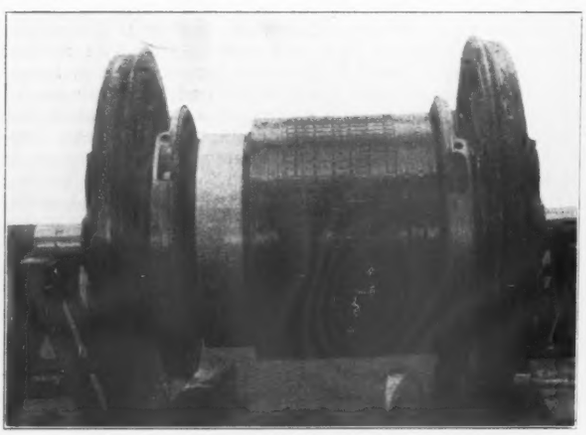
in a harness which definitely fixes the radius of movement of the spring tip. A pawl on the side of the spring harness allows easy adjustment of the tension.

The weight of each motor is carried on a frame which passes over the wheels and side frames and rests on the journal boxes. Each frame carries four bolts which receive the weight of the motor and each bolt is fitted with a heavy coil spring at its lower end through which all weight is transmitted to it, so that the motor is carried on very flexible springs and is independent of the truck frame. The torque of the motor and the jar caused by sudden starts and stops are transmitted from the motor to the truck through heavy tie-rods which affect the motion of the motor only lengthwise of the locomotive. The armature is not placed directly on a shaft but is built up on a quill through which the car axle passes with about ⅝ in. clearance all around. The bearings which carry



Truck for A. C.—D. C. Electric Locomotive.

the field frame are mounted on this quill and from a flange at each end of the quill seven round pins project parallel to the shaft into corresponding pockets formed in the hub of the driving wheel. The torque of the motor is transmitted from these pins to the wheel through helical steel springs which are wound with their turns progressively eccentric, and which are contained between two steel bushings, the smaller of which slips over the pin and the larger fits in the pocket in the wheel. These springs are under compression both longitudinally and horizontally so that, at all times, they fill the pockets in the wheel but permit a vertical and a lateral motion. Their longitudinal compression between the quill and the segmental cover over the outer ends of the pockets in the wheel keeps the motor at all times midway between the hubs. The end play of the motor does not come directly on the wheels but is taken by strong coiled springs inside of the driving pins, which press against the covers in the outer ends of the spring pockets in the wheels. Though normally required to transmit only the torque of the motor and to keep the motor axis parallel to

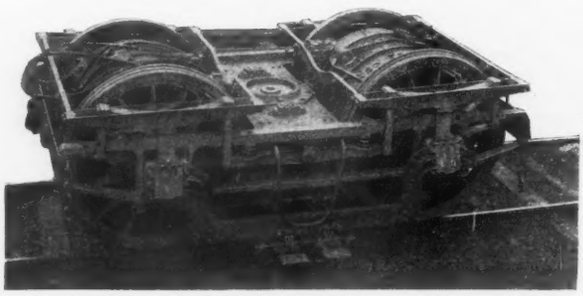


A Pair of Drivers with Motor Armature, Bearings and Housings.

the axle, these springs are amply strong to carry the entire weight of the motor. They allow a total vertical movement of about ¾ in. The torque of the motor is taken by heavy parallel rods which anchor the frame to the truck above and below the axle and permit vertical or side motion of the motor but prevent excessive bumping strains from coming on the driving springs. If these springs are compressed more than ¼ in. by the heavy centrifugal force exerted by the motor when rounding curves, the force is taken up by noses on the motor which fit into corresponding recesses in the cross-ties between the side frames of the locomotive. This suspension has the advantage of removing all dead weight from the axle, of driving through springs, and at the same time of having the motor thoroughly anchored to prevent undue strain on the driving spring. The only parts of the locomotive not spring supported are the driving whels, axles and journal boxes. It is a great improvement on any method of mounting gearless motors heretofore devised.

The motors are arranged for ventilation by a forced circulation of air which enters under pressure, is distributed throughout the motor and escapes through the perforated covers. In the floor of the cab there is a natural conduit formed by the side channels of the frame, the floor and side walls of the cab, and a lower plate, through which air is carried to the motors, transformers and resistances. This method of cooling improves the continuous capacity of the apparatus and is, in a large measure, accountable for the high continuous rating of the motors which almost equals that on the one-hour railroad basis. The air furnished to the motor is taken from the inside of the cab and can therefore be kept relatively clean and dry.

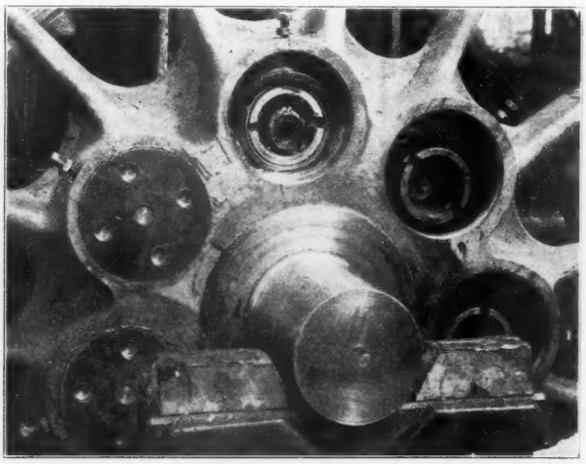
On the direct-current part of the line current is taken from the



Truck Completely Equipped with Motors and Contact Shoes.

third-rail system by eight collecting shoes, four on each side of the locomotive, arranged in pairs of two each. There are two pairs on each side, one at each end, for the purpose of bridging such gaps as may occur in the third-rail system. The direct-current contact shoes are designed to work on two forms of third-rail—one in which the shoe runs under the rail, and the other on top of the rail. To collect alternating current from the high-potential overhead trolley line, the locomotive is equipped with two pantagraph-type, bow trolleys, each of which has a capacity sufficient to carry the total current required by the locomotive under average conditions—two being provided to insure reserve capacity.

On direct-current the motors are controlled in series parallel as in ordinary street railway practice. In alternating-current operation no resistance is used in the regular run, but a small resistance, which constitutes a preventive device to diminish the short-circuiting effect when changing from one transformer tap to an-

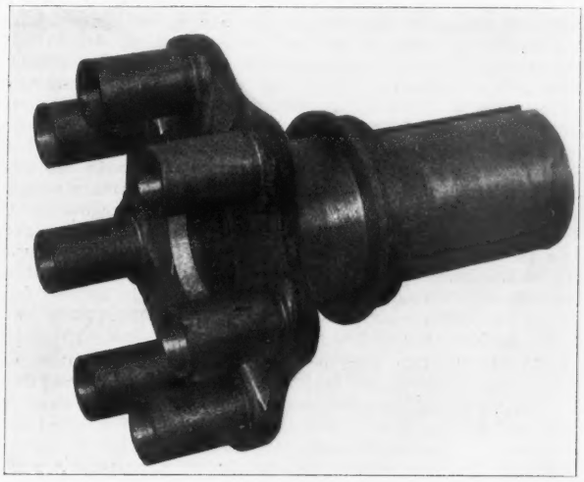


Detail of Driving Wheel.

other, is employed in passing from one working step to the next. There are six alternating-current voltages or running points, corresponding to six taps from the auto-transformers, and there are a small number of mid-way steps which are used only in passing between working notches. Experience has shown that the number of steps required in alternating-current operation to give a smooth acceleration is considerably lower than in direct-current practice. In consequence, the controller is so arranged that on alternating-current about half as many steps are used as on direct-current. Tests so far conducted show that the acceleration on both alternating and direct-current is very smooth.

There is one feature of the direct-current control which is not generally found at the present time in direct-current equipments, viz., the shunting of the field for higher speeds. In the series position in direct-current operation the motors have an efficient running

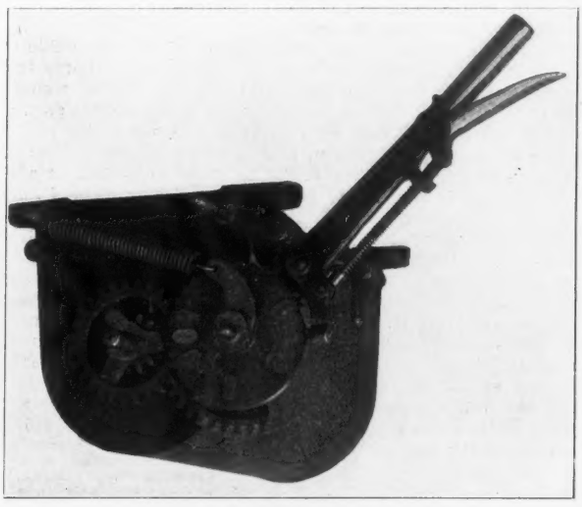
point. It is usual railroad practice to pass from the series to the multiple position without an efficient intermediate running speed. With the New Haven equipments, however, the type of motor used permits an almost indefinite shunting of the field without impairment of commutation or operation and higher speeds are provided by shunting the fields before passing into multiple. In this way several efficient running points are obtained between the series and multiple positions; and tests have shown that these motors operate properly on direct-current with their fields shunted down to less than half their normal strength. When operated on direct-current, the current is fed directly to the motors. On alternating-current,



Armature Quill.

however, auto-transformers are required, as the alternating-current trolley voltage is 11,000. Two such transformers form part of each equipment—one mounted on each side of the cab floor to balance the weight. They are connected in parallel across the high voltage, but on the low-voltage side each transformer feeds one pair of motors through a separate control unit. This means that the control system when operated on alternating current consists of two normally independent units.

The main controllers are of the well-known Westinghouse electro-pneumatic unit switch type. The design differs somewhat from that used in direct-current service, because of the fact that the



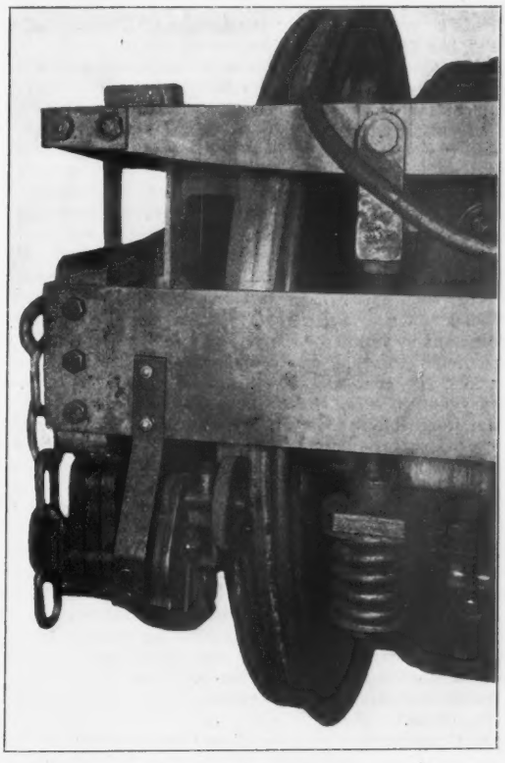
Master Controller.

switches, blow-outs, etc., must operate on both alternating and direct-current, as many parts of the controller are common to both systems. The reversing switches are also parts of the unit switch groups. The main controllers are operated from master controllers at each end of the cab. The control system is arranged for multiple unit service, so that two or more locomotives can be coupled to the same train and handled by a single driver.

There are six switch groups, each containing unit switches. The two line switches are so connected in the switch groups that each carries the current supply to each pair of motors when they are operating in parallel construction. When the motors are in series, one of the line switches carries the current supply to all. Each line switch is provided with an overhead trip so connected that all of the switches of both switch groups as well as both the line switches open in case of an overload or short circuit on either pair of motors or in the circuit of either pair. The overload trip is automatically locked out when brought into action and cannot be reset until the master controller is returned to the off position.

The external resistances used in regulating the flow of current to the motors are arranged in two groups which are connected in series when the motors are in series, and in series with each motor when the motors are in parallel. The change over between the direct-current third-rail and the alternating-current overhead system can be made easily and quickly even when the locomotive is running at full speed. An ammeter is mounted in each end of the locomotive in plain view of the operator when at the master controller.

The master controller is of the drum type and is operated by a lever which moves through an arc of about 60 deg., with notches and latch wheel to define the different positions. Reversing is accomplished by a separate handle which interlocks with the main lever. When the master controller is in the off position, connections are so established that all circuit breaker trips which may be open are closed by the simple closing of a small switch conveniently located in the locomotive cab. Current is supplied to the control



Magneto Speed Indicator.

circuits by two sets of seven-cell storage batteries, each of which has a capacity of 40 ampere-hours and weighs 150 lbs.

In connection with the switch groups, cut-out switches are provided so that either pair of motors may be cut out by simply rendering certain switches inoperative. It is thus possible to cut out the motors without manipulating the main circuit.

The auxiliary equipment includes two air compressors driven by motors which can be operated on either alternating or direct current; two blowers driven by similar motors and which furnish air to the transformers, motors and direct-current rheostats; oil circuit breakers for the high-tension circuits; switches to change the equipment from alternating to direct current; a steam generator to supply heat to the railroad coaches in cold weather; a complete Westinghouse air-brake equipment, signal apparatus, automatic bell ringers, whistles, sanding apparatus, etc.

The New Haven locomotive measures 36 ft. 4 in. over the bumpers and weighs approximately 85 tons. It is capable of handling a 200-ton train in local service on a schedule speed of 26 miles per hour, with stops averaging about two miles apart—making in such service a maximum speed of about 45 m.p.h. It can also handle a 250-ton train on through service with a maximum speed of about 60 miles per hour. With heavier trains it is planned to couple two or more locomotives together and operate them in multiple.

The tests which have been made on the first locomotive equipped

show that it will, without difficulty, meet all the requirements for which it has been designed. This locomotive has, on actual test, repeatedly accelerated a 200-ton train at a rate of .5 of a mile per hour per second, which is in excess of the rate required by the service conditions of the New Haven road. The current and power consumption correspond very closely to the predetermined values. The line upon which the locomotive has been tested is not well adapted to high-speed work on account of the numerous sharp curves which exist, but, in spite of these adverse conditions, the locomotive has been operated at speeds above 60 m.p.h. without difficulty.

Some Phases of the Panama Problem.*

BY JOHN F. WALLACE.

The events connected with the Panama canal project during the first two years of American control have been of such a kaleidoscopic nature that it would require an intimate acquaintance with the actual facts to understandingly consider the situation. Briefly, the present status is that we have been in possession of the work for approximately two years, have expended some 70 millions of dollars, and have excavated about 1 per cent. of the material which must be removed from the Culebra excavation for a sea-level canal, or 2 per cent. of the amount of material to be excavated for the high-level project. The importance of the work done, however, while it cuts a very small figure compared with the amount to be accomplished, has developed very interesting figures as to the efficiency of machinery, methods and character of labor employed, nature of materials to be encountered, climatic influences; in fact, has produced a great deal of data not only useful in itself, but giving fundamental information, from which valuable deductions may be derived as to the efficiency of modern appliances and proper methods of work.

The nucleus of the organization which was started by the speaker was developed from practically 500 French and native employees to from eight to ten thousand, which, since the speaker's resignation in June, 1905, has been practically doubled. Up to the present time this force has been employed largely on preparatory work of all kinds, such as the construction of sewers and water supply for the various towns and cities, the clearing away of the jungle, the drainage of swamps, the enforcement of sanitary measures, the provision of quarters, the conduct of engineering surveys and technical studies, the construction of railroad tracks, shops and other preparatory facilities for the future conduct of the work; the purchase, manufacture, erection and installation of steam shovels, locomotives, engines, cars, shop machinery, and other facilities needed. The present situation is that of an army of 20,000 men and officers equipped and waiting for instructions as to the plan of campaign, before the word is given to strengthen up the skirmish line and commence the attack upon the enemy.

During the last two years the Isthmus has been covered with engineering parties, verifying, correcting and elaborating previous surveys and technical studies, and they have determined not only the configuration of the ground along and adjacent to the proposed line of the canal, but have drilled its surface to the depth of 40 ft. below the sea-level from one end of the canal route to the other to develop its subformation, and they have measured and gaged the streams draining the territory along and adjacent to the line of the canal.

While there remain many engineering problems of greater or less importance in regard to the solution of which even engineers of great reputation differ, and while the detailed engineering works are of magnitude, it is generally conceded that no engineering problems remain which are impracticable of solution, and that even a sea-level canal is possible, the time and cost of its consummation having been found to be within reasonable limits. And at last the great problem as to the selection of a plan—whether it shall be one with six locks at an elevation of approximately 85 or 90 ft. above sea level, or a sea-level canal—has been submitted to the American Congress by the President for its final decision, together with views and opinions of the leading engineers who have given this question study, and the data upon which these conclusions are based.

As the speaker will probably be called upon by the Senatorial committee to give his views on the general question of plan, he does not consider it proper to discuss this feature of the situation in detail at this time, but desires more particularly to call attention to the fact that consideration of the questions of administration and the methods under which this great work shall be conducted is equally vital. While there is no doubt but that, out of all the controversy on all matters connected with this great subject, success will finally come, it is a question whether it shall be attained in a straightforward, efficient, business-like manner, resulting in the economical, efficient and speedy construction of the best type of a canal to serve the commerce of the world through future generations, or whether we shall finally reach the light after stumbling along in the dark, falling occasionally in the "slough of despond," and only achieving success after the wasteful expenditure of millions, the lapse of years of time, and with our self-esteem and great American boastfulness badly damaged.

*An address delivered at a dinner of the Illinois Manufacturers' Association, Chicago, March 2.

METHODS.

From the experience of the speaker in connection with this and other public works, he is forced to the conclusion that either the work should be put into the hands of one strong man, with practically unlimited authority, combining the technical and scientific training of the engineer with the administrative and executive ability of a man of force; with this should be coupled the separation of all matters connected with this work from the control of the ordinary Government departments at Washington—under such supervision only as to insure the Government that his administration is efficient; or the same result accomplished through the letting of the work to a contracting firm, large enough to control under one management the entire constructive work on the Isthmus, under broad and general specifications and under such general supervision as may appear to Congress to be proper. The first step of any contracting firm would then be to place its affairs in the hands of a strong single executive, supported by such advisory technical knowledge as might be deemed necessary. The precedent for this method, and a working application of this principle, is the special agreement which was made for the construction for the improvements at the mouth of the Mississippi under Capt. Eads. It was a contract which bound the contractor to certain results for a specific sum, and no more satisfactory compact for public work was ever made by the United States.

It is only in this way, or some substantially identical way, that the construction of the canal can be successfully accomplished. While the work may be completed at some time, and at some cost, by the poorest and most inefficient method—even by hired labor under Governmental control—the accomplishment will be far from satisfactory. It goes without saying that if any large American corporation were engaged in the business of constructing a great public work for the purpose of furnishing transportation, unhampered by political questions or selfish interests, the work would attract practically no attention, except the ordinary interest connected with an engineering project of great magnitude. It is a fact of which the public is not aware that many of the large railroad systems to-day are spending as much money annually in the improvement, maintenance and operation of lines of transportation providing for the handling of tonnage much greater than that which will pass through the Panama canal, or will be expended on the Panama canal, and their operations proceed with hardly a newspaper notice.

It may be argued that commercial interests would suffer by placing the Panama railroad under the control of a general contractor, and that it will be difficult to secure the proper control of its obligations as a common carrier.

The plan suggested in my official communications on this subject was that of operating the Panama railroad as a simple transfer organization, whose sole duty as a common carrier would be to receive the freight delivered at its ocean wharf on one side, and deliver it at the ship dock on the other side, for a flat rate per ton—regardless of classification, except so far as the cubical contents of certain light articles would be made equivalent to a ton. The proposition is simple and perfectly practicable. The forwarding agents of the world would thereafter bill all goods over transportation lines using the Panama railroad as an immediate transferring link, on their bills of lading, subject to the transfer charge across the Isthmus of Panama; this could be collected by Government agents, either from the steamship line delivering the freight or the one receiving it. In this way no complication of accounts would be necessary, and all commercial interests would be treated with equal fairness. It would be a simple, normal and logical introduction to the conditions which will exist when the canal is opened and rail trans-shipment gives way to through passage of shipping under a flat tonnage charge, and would save over $100,000 per annum of the expense of management through the present New York office alone.

One of the objections raised to the proposition was that "it would unsettle transcontinental rates." If this is to be a final and determining reason, why are we building the Panama canal?

After the proper facilities have been provided in the way of docks and wharfs, double-tracking of the Panama railroad, and providing it with modern equipment, there will be no difficulty in a general contractor easily, promptly, and economically handling all the commercial freight, without any interference with the canal construction work; particularly if he has the absolute control of both, and is held accountable only for the proper performance of the duties of a common carrier.

The question of local rates and the charges to be made for this service by the contractor are simple, and easily adjusted; it would seem a brilliant opportunity for the United States Government, either through its Interstate Commerce Commission or otherwise, to experiment with the regulation of rates across the Isthmus

and the general control of the operation of the Panama railroad, and acquire some experience therein before attempting to tackle the complicated problem of regulating the rates and controlling the methods of doing business on 200,000 miles of railroad which interlace and ramify throughout the United States. The transportation rate problems of Panama, as compared with those of the United States as a whole, might be likened to a single grain of sand compared with the seashore.

THE TEHUANTEPEC RAILROAD IN COMPETITION WITH SUEZ AND PANAMA.

While the construction of the Panama canal will confer great benefits on the commerce of the world, the commercial interests of Great Britain have not been blind to the possibilities of a project and route, which will, in a large measure, anticipate the future benefits of the construction of the Panama canal and give immediate results, pending its accomplishment, with a strong probability of being able to retain the trade if once secured. I refer to the railroad transportation facilities which are about to be completed in the interests of British capitalists, across the Isthmus of Tehuantepec, a distance of about 176 miles.

This railroad is being constructed in a most substantial manner, provided with the very best facilities, equipment, etc., in order to handle a large amount of traffic at the minimum cost per ton. Modern machinery and methods will enable this railroad to conduct a profitable business at a rate of not to exceed $2 a ton from shiphold to shiphold; and with the best modern loading and unloading facilities, proper wharves, warehouses, and harbor terminals, the time from ship to ship should not exceed an average of two days.

It is fair to assume that modern cargo steamers are able to handle the average run of ocean freights with profit on a basis of one-tenth of a cent per ton per mile, or, in round figures, $1 per 1,000 miles. The advantages of the Tehuantepec route over the existing route to the far east by way of the Suez canal are as follows:

From New York to Australia, say the port of Sydney, the saving in distance by way of the Tehuantepec Railroad would be 5,700 miles, and any railroad rate across the Isthmus of Tehuantepec, less than $5.70 per ton, should take this business from the Suez route. In addition it would save the time that it requires an ordinary cargo vessel to steam 5,700 miles, minus the time required to transfer the freight across the isthmus by rail. This would make an actual saving of time of at least 15 days, even allowing the maximum of four days for the isthmian transit.

From New York to India and China points, this route would not be so material, as the line of least resistance from a traffic standpoint would be over the transcontinental lines through San Francisco, Seattle, or other Pacific ports.

From Liverpool to points in the far east where the distance is the same, the Tehuantepec ship railway could charge the Suez tolls, which are approximately $2 per ton, and compete for the business with a fair profit.

Turning to the ports, however, in the United States, the advantages given by this route are also remarkable. From New Orleans to Hong Kong, the saving would be 4,800 miles over the Suez canal route, and would yield the Tehuantepec railroad $4.80 a ton on the basis of equivalent charges by the Suez route, in addition to saving from 12 to 14 days in time.

From New Orleans to Yokohama the saving over the Suez route would be 8,400 miles, which would enable the Tehuantepec railroad to charge $8.40 per ton for the transit of freight on its railroad, on an equivalent basis with Suez, and save approximately 24 days in time. From New Orleans to Australia, the port of Sydney, the figures would practically be the same.

As there is little question of the ability of this railroad to handle freight from ship to ship for $2 a ton or less, its ability to build up an enormous business to the far east in competition with the Suez route is plainly manifest.

Let us now compare the Tehuantepec route with that of the Panama canal on the same assumption that $1 per ton will carry ocean freights 1,000 miles, and that $1 per ton will be the minimum rate charged for transit through the canal.

From Liverpool to Hong Kong, the saving in distance via Tehuantepec will be 1,200 miles, and allowing two days for the transit of the freight across the Isthmus of Tehuantepec, the saving of time will be approximately two days. The saving in distance will be equivalent to $1.20, which added to the minimum charge of $1 through the Panama canal, would give $2.20 as a maximum charge to the Tehuantepec railroad.

From Liverpool to Yokohama the saving as against the Panama route will be 1,100 miles. From New York to Australia, port of Sydney, the saving will be 761 miles, which, on the same basis as just stated, would yield the Tehuantepec railroad a maximum charge of $1.76 a ton, or approximately one cent per ton per mile; some 40 per cent. higher than the average rate on the trunk lines in the United States.

From New York to San Francisco the saving will be approximately 1,200 miles, which would yield $2.50 as a maximum rate to the Tehuantepec railroad.

From New Orleans to Hong Kong, a common point for northern China, the saving of the Tehuantepec line over Panama is approximately 2,000 miles, which would permit the Tehuantepec railroad to charge a maximum of $3 per ton on an equivalent basis, and save in time approximately five days.

From New Orleans to Australia, port of Sydney, the saving would be approximately 1,400 miles, allowing the Tehuantepec railroad a maximum charge of $2.40.

From New Orleans to Honolulu the saving would approximately be 2,000 miles, permitting the Tehuantepec railroad to charge a maximum rate of $3 per ton.

From New Orleans to San Francisco the saving in distance via the Tehuantepec route would be 1,800 miles, permitting the Tehuantepec railroad to charge a maximum of $2.80 per ton, with corresponding saving of several days in time.

The advantages of Tehuantepec over the Suez and Panama routes in the saving of money and time make it self-evident that in the years that will elapse before the completion of the Panama canal, our British cousins will undoubtedly build up a large and profitable business, which it will be difficult thereafter to divert back to the Panama route.

I do not submit these ideas to discourage our own enterprise, but simply to show the cold facts and to point out at least the direction in which I think the remedy lies: It is in the immediate provision at Panama of the proper facilities and equipment for the development of the maximum efficiency of the Panama Railroad, and the putting in of a flat rate of not more than $2 a ton and possibly as low as $1.50, in order to prevent other lines from diverting traffic from that route, and to encourage and expand the traffic tributary to it. That this can be done, without any material loss to our Government, is evident.

A rate as low as $1.50 a ton—which will give an average of two cents per ton per mile for transit over the Isthmus and allow 50 cents per ton for the handling of freight from ship to car and from car to ship—would be ample, after complete facilities for handling the business had been provided and the business had increased to a sufficient amount to justify it—say to 1,000,000 tons per annum.

So far as the mere question of rate is concerned, with the only disadvantage of breaking bulk, this rate would immediately enable us to compete with the Suez canal on all traffic from the United States ports to the far east, and from the ports of Europe to Australia, Japan, China and all points east of Singapore; and so far as our trade with the west coast of South America is concerned, this would give the United States, particularly the Mississippi valley, a decided advantage over all the ports of Europe, and would enable us to anticipate the larger part of the advantages of the Panama canal. It would give our merchants and manufacturers such a foothold in this trade, provided it is properly catered to and developed, as would enable it to be held at least in part.

The failure of the United States to improve and utilize the Panama railroad to its full capacity, and do it at once, may seriously affect the value of our Panama investment, which has already reached 70 millions of dollars, and may reach 300 millions.

UTILIZATION OF THE PANAMA RAILROAD.

The great direct benefit of a flat rate of $2 a ton or less across the Isthmus of Panama by rail will at once put us in a position, where, for a comparatively small investment not exceeding 2 per cent. of the total cost of the canal—which investment should be made in any event, in order to assist in its construction—a large percentage of the ultimate advantage to be derived from the canal, commercially, will be secured. The greater part of this benefit will lie in the reduction of rates, which will result to the benefit of the agricultural and commercial interests of the countries in Central and South America bordering on the Pacific below the Mexican line.

While the proportion of the rates which have accrued to the Panama railroad on business from New York to San Francisco has been low and reasonable, its charges on the traffic passing over the Isthmus to and from the countries bordering on the Pacific coast in Central and South America have been exorbitantly high, and have been kept by the railroad at a figure as high as possible without causing the traffic to be diverted around Cape Horn. It is the speaker's recollection that the rate which accrued to the Panama railroad on coffee from Costa Rica has been as high as $6 a ton for the distance across the Isthmus, say 50 miles. A lowering of the rate to $2 a ton or less will stimulate all forms of agricultural and commercial enterprises in the countries affected thereby. It will largely increase the population and the consuming capacity of these countries; and if this trade is properly fostered and catered to by the manufacturers and merchants of the United States, it should yield large benefits and cement the political, commercial and personal friendships between ourselves and the nations of Central and South America.

RELATION OF TRANSCONTINENTAL LINES TO THE PANAMA CANAL.

One of the most erroneous impressions that has gone forth, and which the press and the public seemed to have thoroughly absorbed, is that the transcontinental railroad lines are in mysterious ways working to delay or defeat the completion of the Panama

canal. The speaker has no interest whatever in this matter, beyond a desire to correct what he feels to be a false impression.

The only ground for a motive of this kind would be in case the construction of the Panama canal would reduce the traffic rates from the Atlantic to the Pacific seaboard to such an extent as to interfere with the business of through transcontinental lines. It is a fact known only to a few persons and those who have direct knowledge of the existing rates and their divisions between the Panama Steamship line, the Panama Railroad, and the Pacific Mail Steamship line, that the average rate of charge which accrues to the Panama Railroad Company for the transportation of freight between New York and San Francisco, is less than $2 per ton. If the rate to be charged for transit through the canal is to be the same as Suez, the future rates between San Francisco and New York cannot be materially affected by the construction of the canal.

If the rate is hereafter reduced to $1 a ton for transit through the canal or pending its construction, and the Panama railroad rates are reduced to this figure, the reduction will be so slight that it will have little or no effect on through transcontinental rates, and will probably effect no greater reduction than will gradually be made by reason of competition existing between the railroads themselves.

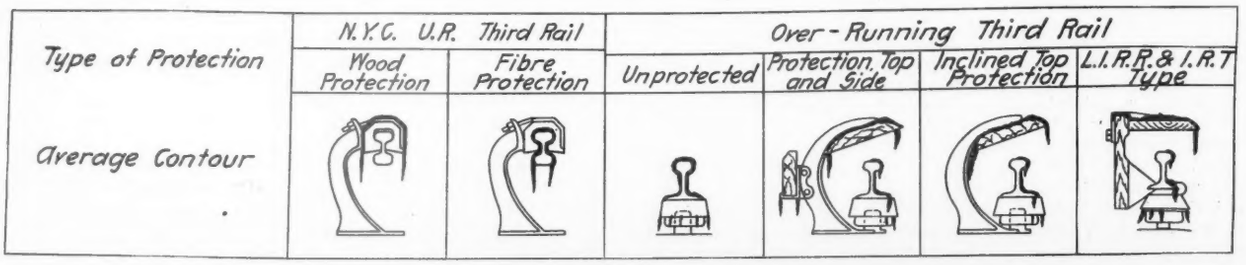
The only advantage gained, so far as New York and San Francisco business is concerned, by the construction of the canal, will be the avoidance of breaking bulk. This, to some extent, however, will be necessary even after the canal is completed, as the probabilities are that cargoes will be consolidated at least to some extent at the Isthmus in order to cheapen transportation. As the rates heretofore existing between New York and San Francisco via the Isthmus have been generally from 30 to 35 per cent. lower than the through trans-continental rates by rail, and as this differential has not been able to secure any great share of the business between these two points as against the through transcontinental lines, it would not appear that the parties interested in these lines have any cause to become unduly apprehensive, or have any motive for an expenditure of their time and money to either defeat or delay the canal project.

When it is understood that to the through ocean rate must be added the local rates for carrying freight from inland points to the seaboard on either coast before through shipments can be made, it will be readily seen that the amount of tonnage between the Atlantic and Pacific coasts using the canal route will necessarily be limited to the traffic originating at the sea ports, and that the traffic from the interior cannot be expected to take the ocean routes in preference to those offered by rail. Even in this case only certain classes of goods will withstand the ocean voyage, which will require from three to four weeks.

The speaker has had a wide acquaintance among men interested in the transcontinental lines, and he has yet to know of a single step being taken, by those interested, in opposition to the project, and is satisfied that nothing of this kind will be done and that no reasonable motive exists therefor. His attitude towards the canal project is that of a patriotic American citizen, whose only desire is the promotion of his country's welfare, politically and commercially, and whose hope is that this great enterprise will ultimately be accomplished in an honest and efficient manner, and add to the glory and prosperity of our nation.

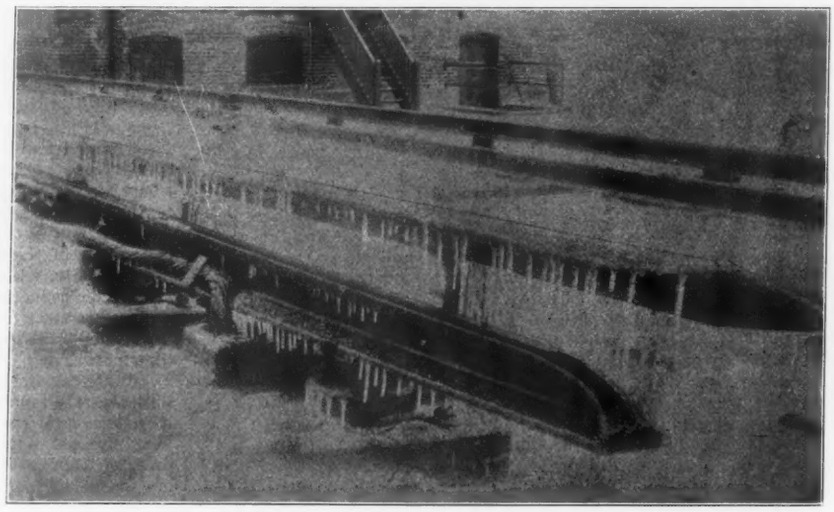
Effects of a Sleet Storm on Different Types of Third Rail Protection.

One of the drawbacks which has to be overcome in third rail operation is the coating of the contact rail by snow, ice and sleet, which causes arcing of the contact shoes and consequent difficulty in maintaining the current in the motors. In the *Railroad Gazette* of February 16th there was described a very unusual and interesting test of one of the New York Central's electric locomotives during a severe snowstorm on February 9th. This went to show the practicability of the under-running type of third rail for operation under such conditions. On March 3d a different set of weather conditions gave a further chance for comparison of various types of third rail protection. There was a light rain, followed by hail, followed by rain again, with the temperature ranging from 28 deg. to 33 deg. Fahrenheit, and an east wind with a velocity of two miles an hour. The sleet began to form at nine in the morning and continued to form throughout the day, the quality of the sleet varying with the temperature. In thickness it averaged about one-quarter of an inch. The accompanying sketches and photographs



Sleet Formation with Various Types of Third Rail Protection—New York Central & Hudson River.

Sleet formation on Over-Running Third Rail; Interborough Rapid Transit and Long Island R. R. Protection.



Sleet formation on Over-Running Third Rail; Inclined Top Protection.

Effects of Sleet Storm on Over-Running Third Rail; March 3, 1906—New York, Central & Hudson River.

show the sleet formation on the rail, with the various types of protection.

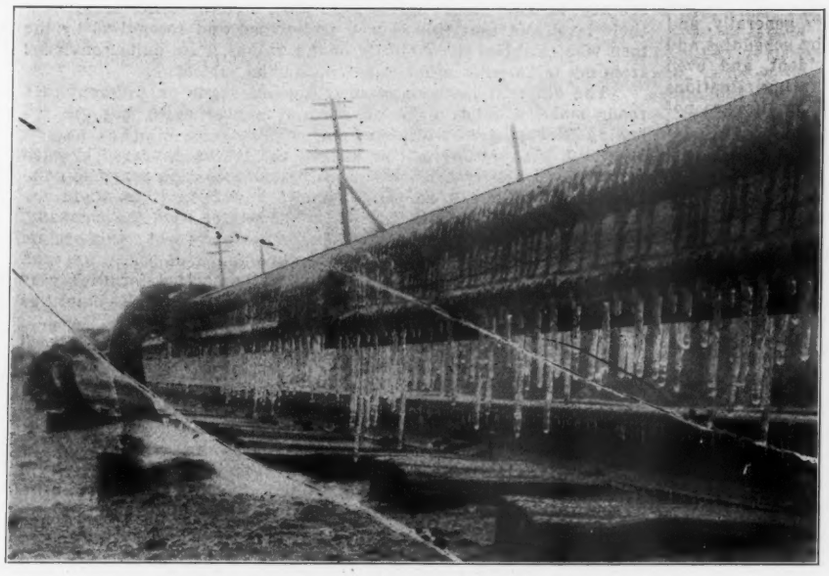
There were two types of over-running rail tested:

On the unprotected over-running rail the sleet was so bad that after three hours it was impossible to run.

On the inclined top protection over-running rail on the section of the track where the wind could get at the side of the rail the sleet formed at some points entirely over the top of the rail. At such places the contact shoes arced badly.

Operation of each type of the over-running rail was thus shown to be unsatisfactory under these weather conditions.

Sleet formation on Under-Running Third Rail; Three-Piece Protection.



Sleet formation on Under-Running Third Rail; Fibre Protection.

Effects of Sleet Storm on Under-Running Third Rail; March 3, 1906—New York Central & Hudson River.

There were three types of the under-running rail tested:

On the under-running rail with wood protection the drip carried the sleet off the edge of the slide board and no sleet formed on the rail.

On the under-running rail with fibre protection, the drip was carried off by the fibre and no sleet was formed on the rail.

On the under-running third rail with mica compound insulation, except on the edges of the rail, no sleet formed.

The superiority of the under-running rail over the over-running type was therefore shown under these weather conditions.

After a number of trials, the attempt to run on the exposed third rail was given up, and operation was confined to the protected sections. On the protected top running rail there was considerable arcing of shoes, but on the under-running rail there was no sign of arcing.

Railroad Commissioners' Convention at Washington.

[*Continued from last week, page* 354.]

The subject of rate legislation was briefly discussed and the report of the Committee was unanimously adopted. This report, which discussed the subject at length, concluded with a recommendation to the effect that the powers of the Interstate Commerce Commission should be enlarged so as to give it authority to correct any unreasonable or unjustly discriminatory rate, regulation or practice, and to substitute a just and reasonable rate, regulation or practice in lieu thereof; that the orders of the Commission should be made effective, but that the legislation should preserve to the carrier the protection of the courts in all its rights under the legislation. A proposition was submitted by Mr. Chadbourne, of Maine, the chairman of the Rate Committee, that the traffic managers of the railroads should be invited to meet with the association next year and contribute their expert knowledge on the subject of rates, but it was voted down.

The report of the Committee on Safety Appliances was adopted. This contained a recommendation to be made to the legislature of each State separately urging the passage of an act identical with the Ohio law which denies to the carrier the right to defend its act in case any one is injured by a violation of the safety appliance law. The report again called attention to the need of a law requiring the use of block signals, and a resolution offered by Mr. Kilpatrick, of Illinois, asking Congress to provide for the appointment of a commission to inquire into the matter of the best automatic block signal system available for use on the railroads of the United States, was adopted. The bill for a compulsory law, introduced in Congress by Mr. Esch, is still in committee.

The present report also emphasizes the dangers due to the employment of men in train service excessive hours. It says: "The records of the Interstate Commerce Commission show that the railroads have reported, under the requirements of the accident law of 1901, a total of 118 accidents, involving the death of 51 persons and injury of 198 persons, where the employees involved had been on duty from fifteen to forty-eight hours. Many of these accidents were directly caused by employees falling asleep at their posts of duty. * * * This question of long hours is one that urgently calls for regulation, both by the Federal Government and by the States. A bill which has the support of the railway employees' organizations was introduced in the House by Representative Esch, of Wisconsin, and in the Senate by Senator La Follette. Another bill, which is without the indorsement of railroad employees' organizations was introduced in the House by Representative Norris, of Nebraska. Only a few States have as yet made any attempt to regulate the hours of labor of train employees, and even in those cases where legislation has been attempted the effort seems to have been to prevent railroads from compelling train employees to work an excessive number of hours for a single day's pay, rather than to protect the public safety by requiring absolutely that employees shall neither be required nor permitted to remain on duty an excessive number of hours consecutively. In even the best laws there is no limit to the number of hours a man may be permitted or required to work, and there is absolutely no protection to the public.

"Following the example of Illinois, the State of Ohio has passed a safety-appliance law, patterned after the Federal statute. A law such as this should be on the statute books of every State in the Union. The Federal statute has stood the test of the courts, and no mistake can be made in adopting it as a model for State laws. Its provisions have been embodied in the Ohio statute (referred to above), and also a bill now pending in the legislature of the State of Kentucky.

"Your committee recommends also an additional section covering the matter in which it is now proposed to amend the Federal law, and that is to give the various State commissions authority to make all necessary and proper regulations to carry the law into effect, including regulations for the direction and guidance of such inspectors as may be appointed to execute and enforce the law."

The Association adopted a resolution offered by Mr. B. H.

Meyer, of Wisconsin, declaring it to be the sense of the association that Congress should authorize and direct the Interstate Commerce Commission or some other department of the national government to ascertain the inventory value of all of the railroads in the United States, and to ascertain the value of the railroad property of each State separately. Consideration of the report of the Committee on Railroad Taxation was deferred until next year.

The report of the Committee on the Powers, Duties and Work of railroad commissioners led to a discussion which showed that many of the commissioners are not satisfied with the existing legislation in their respective States, and are seeking increased authority. One of the propositions favored by some of the delegations was that of "reciprocal demurrage," by which a railroad would be compelled to pay demurrage if a car should be demanded and should not be supplied within a specified time.

John S. McMillan, of Washington, was elected president of the association for the ensuing year, and Seattle, Washington, was selected as the place for the next annual meeting, the date (between July 1 and August 31), to be determined by the executive committee.

Mr. Buehring on Seniority.*

The Brown System of Discipline has been so generally adopted throughout the United States that it would probably be safe to say that the larger part of the operating officials of American railways regard it as giving better results than any other. Again the Seniority Rule as to promotion of employees, and especially those classes of employees generally affiliated with labor unions, is in force to even a greater extent than Brown's Discipline. The two things are interdependent because of the qualifying clause of the Seniority Rule—"Men will be promoted in order of seniority, *other things being equal.*" To the extent that regard is paid to the spirit of the italicized clause, the record of the employees enters, and, hence, the system of discipline in use as well.

This relationship is not generally acknowledged because discipline methods originate with employers and the seniority rule came from the employees, and to merge the two in any way is tantamount to each admitting the other fellow's scheme is good and acceptable *in toto.* But why not? It has not been long since the superintendent was supposed to know whether or not his employee's services were satisfactory and he had "power to act." But organized labor and other factors have changed this very generally, and greatly circumscribed not only his authority, but, by schedules and arrangements, that of the general manager, president, and even chairman of the board, as well. Some very exasperating situations consequently occur, but the men who forge ahead in life are not the ones who spend much time fretting about "tied hands," etc. If one cannot keep from having his hands tied, get as much freedom as possible, and go on.

Now as a matter of fact the employees recognize the necessity of maintaining discipline and enforcing the rules which are essential to safety and the economical operation of the road, but they properly object to arbitrary and excessive discipline, and promptly "take it up to the top" in such cases. On the other hand employers can have no valid objections to seniority if due regard is paid to the spirit of the proviso, "other things being equal." Such being the case, why not make discipline subserve both ends—observance of the rules essential to safe and economical operation of the road and also furnish the data necessary to carry out the spirit of the seniority rule proviso, "other things being equal"? This in effect is the basis of the system suggested by W. D. Buehring, Chief Clerk of the Superintendent of the Tucson Division of the Southern Pacific; and I think, as outlined by him, it is well worth very careful consideration. It consists of keeping a daily record of services rendered by each employee—not of amount in hours or miles or units of work, but of *quality*—balancing it yearly, and using it, and it alone, as the proviso of the seniority rule, "other things being equal."

This system practically possesses the most important characteristic of the Brown system so far as discipline is concerned, because it emphasizes the fact that the successful executive must have the co-operation of his men and that he can obtain it by keeping a record of quality of services. It also does a great deal more, for it is not merely a negative record, a record which shows what a man should not have done, but a positive record whereby a premium is practically paid for good service. It is true some roads now give credit in "Days" and others "Commendations on the Record" for exceptional service under the Brown system, but there is a vast difference between the man who puts in his time and misses any "Brownies" [demerits] and a "rattling good railroad man," and that difference is very largely due to lack of interest—not "hitting the ball." It is just this lack of interest which is so exasperating to the experienced railroad official, for he remembers it was not so when railroad systems were small and the unions did not run the roads. These officials often blame the unions entirely for such lack of interest. If they were right in so doing, their attitude toward labor unions would be entirely justified, because this "doing the least I can to miss the Brownies" is touching very directly the pocket book of the railroad companies. Traffic must be hauled in large units and hauled quickly; delays of even an hour are serious matters, not in overtime particularly, but in power tied up that length of time, traffic congested at terminals and loss of business. Not long since the superintendent had but few and short trains to be moved; but few crews, whom he knew and dealt with personally, and so could enthuse; and no union schedules and agreements to keep him away from his men. The successful executive could get the co-operation of his men by his personality. But conditions have grown quite too complex. The first man—that is the lowest in rank—who is permitted discretionary powers is so far removed from the "man behind the gun" that the men are not working for the "old man" but for an intangible company. They feel that officials may come and officials may go, but they will stay on regardless thereof. Furthermore, transition periods always present unusual difficulties, and the organizations of the modern large systems are getting down to an army basis so rapidly that the employees have not had time to acquire the interest in their new companies' insignias that the soldier has in the flag. And so it is that co-operation of the employees cannot be had without paying a premium for it. By paying its premiums the Buehring system would mark a big step in advance.

The premium so offered is not large enough to be objected to by the unions on the ground of a veiled attempt to lower the wages by increasing the output of the deft employee to the eventual detriment of his less talented brother. As a matter of fact, it is just an incentive to assure a good man who takes an interest in what he does, that the indifferent man, now ahead of him in seniority rights, can be passed, and passed in a time sufficiently short to make it worth trying. It is, of course, possible that the unions will object to removing absolute seniority, but if the members can be convinced that this Buehring record will be *ably and fairly* kept, and that the employee shall have the privilege of appeals from the decision of a subordinate officer, I feel sure the unions would regard it as just as effective a safeguard against the tyranny and favoritism of petty officials as is the present practice, and free from the objection of making the good man help the drone along. That drones are kept in high places by the good work done by better men below their level and that this is well understood and recognized by the men who comprise the majority of the unions, I am quite convinced from my talks with union employees on the subject.

The different methods of discipline in vogue on different railroads make it difficult to lay down iron clad rules, but the following is suggested by Mr. Buehring:

1. A book record will be kept of the service rendered by each employee, in detail, which will be balanced once each year and summarized; each year's record for merit and demerit to stand unchanged during the entire period of his service with the company.

2. Employees in the service of the company when this system is inaugurated, will be allowed a certain number of points for each month's work [in the past], such to be summarized for each year as though this system had been in effect at the time the employee entered the service of the company.

3. The work performed by each man will be classed as Excellent, Good, Indifferent or Poor for each day's work, and his rating established accordingly; 100 per cent. being considered good.

4. Each day's work will be considered to have a value of 100 points of per cent. for conduct and efficiency. An infraction of the rules or failure to meet the standard of efficiency will involve the cancellation of from 1 to 100 points, while excellent service will entitle the employee to additional points of from 1 to 100 per cent. but in no case will more than 200 points be allowed for one day's work.

5. Conduct means the behavior of the employee on and off duty as regards drinking, fighting, disorderly conduct on one side; and especial courtesy and acts of heroism on the other. It is presumed, of course, that employees will observe general good behavior and therefore no special emphasis is placed on this phase of discipline. Efficiency would necessarily be subject to subdivision according to the conditions prevailing at different points, but generally speaking it should cover the salient points of each class of service. For instance, taking the train service (it being understood that both train and engine crews are considered as one unit in giving credit for train movement) a form of conductor's trip report is suggested below.

6. Conductors, enginemen, engine foremen, etc., should make a monthly report on character of service rendered by their brakemen, firemen, switchmen, etc., respectively, which report should be used in the interest of the brakemen, firemen, switchmen, etc.; that is, the report should lead to special examination regarding those rules or instructions wherein they have been reported deficient. Conductors should report as to the enginemen as well as other classes of employees.

*Extracts from a paper by Mr. H. T. Cory, read before the St. Louis Railway Club, March 9, and published in the Proceedings of the Club.

7. Employees whose rating falls below a certain standard are subject to dismissal without further cause.

8. Employees will be entitled to a fair and impartial hearing concerning any entry made against their records and may appeal to the superintendent; and the superintendent will also have the right to charge demerits against the record of any employee for infraction of any rule or instructions, where said offense is not sufficiently serious to justify discharge; but such discipline shall not involve cancellation of more than the number of points said employee is expected to earn during the current year.

9. The violation of any rule which is essential to safety will be considered a dischargeable offence.

First of all comes the necessity of having an accurate check on all work, and a systematic and equitable award for good service. To secure the first result, the following forms of report are suggested, to be turned in by each employee in charge, for himself and crew for each day's work, the entire crew to be considered as a unit.

Train and Engine Service.—The following is the form suggested for reports to be made out by conductors, and on which place is provided for the engineer to make note of any special credit claimed by himself or fireman, or to note exception to the conductor's report in any part. This trip report should be signed by both the conductor and engineer, and carries a par value of 100 points, covering the essential features of road service with supplementary space providing for special features, such as "Good service at wrecks," "Repairs of defects in equipment, track or structures," etc., per sample form appended.

CONDUCTOR'S TRIP REPORT.

District..... Train No..... Date.....
Conductor..... Engineer.....
Brakeman..... Fireman.....
Brakeman.....

	Item.	Value.	Claim.	Allowed
A.	Making schedule or better	40	.....	.....
B.	Getting out terminal on call or better	20	.....	.....
C.	Observance of signals	10	.....	.....
D.	Handling of equipment	10	.....	.....
E.	Protection of train (seals, etc.)	10	.....	.....
F.	General conduct	10	.....	.....
	Supplement. (May be Debit or Credit.)			
H.	Efficient service at wrecks	1-100	.....	.....
I.	Repairs of defects to equipmt, track and struc	1-100	.....	.....
J.	Exercise of good judgment in emergencies	1-100	.....	.....
K.	Special	..	.....	.....
	Totals	..	.....	.....

Remarks .....
(Signed) .....

Each of these regular items has a specific value, emphasis being placed on the prompt movement of trains. The special items have no fixed value and may be 1 or 100 points, but the total allowance for one day's work must not exceed 200 points all told.

As stated above, the crews would be dealt with as a unit as far as the operation of the train is concerned; but this would not prohibit recognition of specially good service, nor would the crew suffer for the delinquencies of any member thereof, for which full charge should be made against the record of the party at fault, the conductor being required to make mention of this under head of remarks.

The point arises: Should a crew be held responsible for delays over which they have no control? The only delay over which there is no control is a wreck, and that is sometimes questionable. Delays for water should be figured in the time-table schedule of the train, and the crew required not to exceed the allowance made for taking water. Delays for break-in-two are strictly "up to" the crew. Delays for orders must be cut out by better figuring on part of despatchers; conductors should be stimulated to make use of telegraphones at blind sidings in endeavoring to get more time on opposing trains.

All employees should be encouraged in assisting each other, in performing work of any disabled member of the crew; and, with the exception of accidents, where disability is self-evident, the disabled employee should have 5 or 10 points canceled from his record, and twice that number of points credited to relieving employee. This would eliminate collusion of employees to unfairly benefit another whose record is, perhaps, not very good.

Station and Telegraph Service.—These reports should cover all points concerned in the operation of an agency and may be equally divided between the telegraph service (giving this 50 points) and the station work (50 points) or a total of 100 points per day, the same as outlined in rule 6, with the allowance of 100 additional points for meritorious acts.

An agent and his telegraphers would be affected by the telegraph department and the agent and his clerical force for the station work outside of telegraph duties. This distinction is necessary on account of the telegrapher being classed as a "specialist," and no clerk can perform his duties, though the telegrapher can perform the duties of a clerk. Hence the necessity of dividing the credits for any station allowing each arm of the service equal share. Furthermore, it also frequently happens that the entire force consists of telegraphers, so that there is no unfair allowance in this proportion.

The following form is suggested for a daily report of the station work:

STATION AND TELEGRAPH SERVICE.

.....Station. Date.....1906.
Clerical Force.
Agent .....
Telegrapher .....
.....
.....

	Items.	Value.	Claim.	Allowed
A.	Handling of train orders	20	.....	.....
B.	Handling of messages	10	.....	.....
C.	Promptly answering calls	10	.....	.....
D.	General conduct (telegraphers)	10	.....	.....
E.	Reports to general offices	10	.....	.....
F.	Reports to superintendent's office	10	.....	.....
G.	Station records	10	.....	.....
H.	Seal records	10	.....	.....
I.	General conduct (station men)	10	.....	.....

Meritorious service, 1 to 100 points, etc.

The agent should be responsible for and stand all demerits and credits that may affect his station both in the telegraph and clerical department. All of the telegraphers should share in allowance for the telegraph department and in the delinquencies of any number of the staff; this would encourage them to help each other out, check mistakes and prevent possible errors. The same idea should hold as to the clerical force and also be applied to failure to get off reports on time and correctly. It is expected that agents have executive ability in handling their men and apportioning their work fairly between them, but if such is not the case, the necessity of the men helping one another to avoid demerits will tend greatly to enforce a readjustment of the work, eliminate any member who may be careless or incompetent, and enforce a co-operation between employees in each class of service; to assure which ends the entire corps must be considered as one unit.

The latter part of rule 8 would be particularly applicable to station service where the infractions of regulations are not subject to classification in a daily report.

Despatching.—The question of applying this system to despatchers is debatable, but might be permissible to the extent of placing a premium on the prompt movement of trains with issuance of as few orders as possible. It is suggested, therefore, that the chief despatchers make a daily report on the work of each man along the following lines. (Let each despatcher be identified by initial):

REPORT OF SERVICE OF DESPATCHER FOR

.....Division. Date.....190....

	Item.	A	B	C	D	E	F	G	H
A.	No. of trains moved	..	..	..	..	..	..	..	..
B.	No. of train orders issued	..	..	..	..	..	..	..	..
C.	No. min. trains delayed-meets	..	..	..	..	..	..	..	..
D.	Do. waiting for orders	..	..	..	..	..	..	..	..

REMARKS.—(Note should be made of any delay on account of operators on line not answering promptly).

This would be on record and have no comparative value in points, but the actual figures in minutes delay, number of orders issued, etc., would stand for themselves.

Yardmen.—Each crew would be treated as one unit and dealt with apart from every crew, and the yardmaster share pro-rata with number of crews in the allowance made, that is with one day and one night crew, the yardmaster would receive one-half the allowance made each; for three crews, one-third, etc.

The following form for a daily report is suggested:

YARDMAN'S DAILY REPORT.

.....Station. Date.....190....
Foreman..... Yardmaster.....
Switchmen..... No. cars handled.....
..... No. cars damaged.....
..... No. trains switched.....

	Item.	Value.	Claim.	Allowed
A.	Delays to trains-switching	40	.....	.....
B.	Handling of equipment	20	.....	.....
C.	Observance of signals	10	.....	.....
D.	Blocking movements of trains	20	.....	.....
E.	General conduct	10	.....	.....

Meritorious services (1 to 100 points)).
.....
.....
.....
.....

The latter part of rule 8 would apply to any individual cases where it is thought best to establish a system of discipline, allowing 100 points for each day's service, and 100 points additional for meritorious acts and enforced cancellation for infraction of rules, as per rule 8 as noted above.

The foregoing forms are given more with the purpose of illustrating Mr. Buehring's ideas, than as proposing them as well thought out forms to be placed in use.

This system, of course, would necessitate having a thoroughly experienced, level headed, conscientious man in charge of the records, upon whom would devolve the task of approving and changing the efficiency credits asked for by the employees making the reports. Not only that, but such official must also have the entire confidence

of the employees affected as knowing his business thoroughly and of being perfectly square. He would undoubtedly have his hands full in attending to such department, for as very little of his work would be routine in character he could not turn over much of it to a clerical force for even a few days; that is, he would have to be in his office a greater part of the time. Furthermore, he would in the course of a year have occasion to explain his decision to pretty much every one of the employees under his jurisdiction, which means he must be tactful and patient. In short, a satisfactory man to handle this branch of the service would be a high-priced official, and according to my ideas, be outranked by no one on a division except the superintendent himself. He should have his hands entirely free in the selection of his clerical force and be subject to only general regulations. It would be advisable for all such officials on a system to have frequent meetings, in order that practice on the various divisions be as uniform as possible. All of this means, in effect, that the carrying out of the proposed system in practice would entail a large expense and add to the enormous number of records and accounts now being increased almost daily on our American railroads. This fact undoubtedly constitutes a serious objection to it. Nevertheless, if by its use, the vast army of railroad employees in the train, engine, station and yard service in this country could be induced to take the personal interest in the work, which a very limited number of them now take, I believe the expenditure the system would entail would be but a drop in the bucket compared with the economies that would be effected.

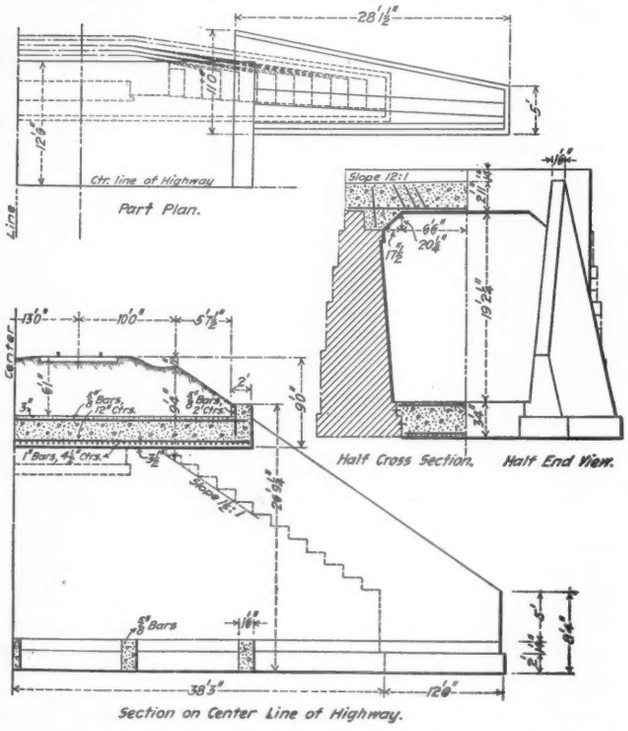
Reinforced Concrete Bridges on the Chicago & Eastern Illinois.

The third-track and other improvement work on the Chicago division of the Chicago & Eastern Illinois, described in the *Railroad Gazette* of March 16, while involving no heavy bridge work, includes several interesting reinforced concrete structures. Plans for two of the arch bridges and a highway under-crossing are shown herewith.

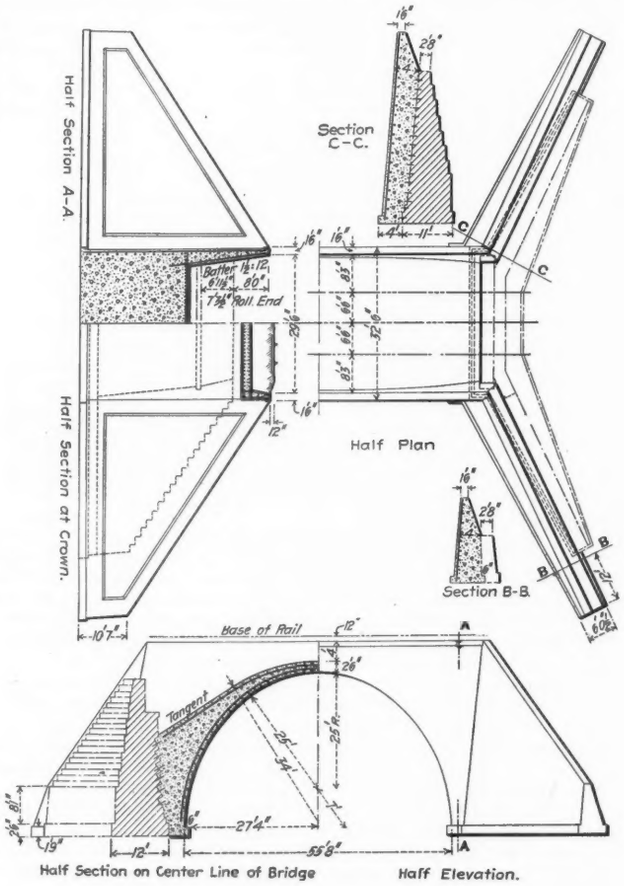
The Stony creek arch is a short distance north of Danville and replaces a double-track 75-ft. deck plate-girder bridge. The grade of the road had to be raised 9 ft. at this point to provide an under-crossing for the Indiana Harbor Railroad. Estimates were made for putting in new plate girder spans designed for heavier loading, as well as for the design adopted. One of the half-tone engravings gives a good idea of conditions prior to making the change, except that the northbound track had been raised to the new grade line, the girders resting on timber blocking on the bridge seat. The southbound track had not yet been disturbed. The masonry abutments were in fair condition and it was decided to use them in the new structure. A new girder bridge would have required these abutments to be built up to conform to the new grade line, but this was out of the question with the existing width of foundation as the additional fill would have imposed an excessive overturning moment. On the other hand, the old fill back of the abutment was thoroughly compacted and therefore capable of resisting part of the thrust from an arch. Conditions therefore were favorable for springing an arch between the abutments, and plans were made as shown herewith.

The primary consideration determining the design was to secure the largest allowable arch that could be sprung between the abutments without imposing an excessive unit pressure on the foundations and to keep the resultant of pressure near the middle of the base. The design used is a parabolic arch of 55-ft. 8-in. span, 2 ft. 6 in. thick at the crown and 32 ft. 6 in. wide over parapets. It is designed for Cooper's E-50 loading, with a factor of safety

Old Bridge Across Stony Creek, Showing Masonry Abutment; Northbound Track Blocked Up to New Grade—Chicago and Eastern Illinois.



Reconstruction of Highway Under-Crossing near Stony Creek—Chicago & Eastern Illinois.

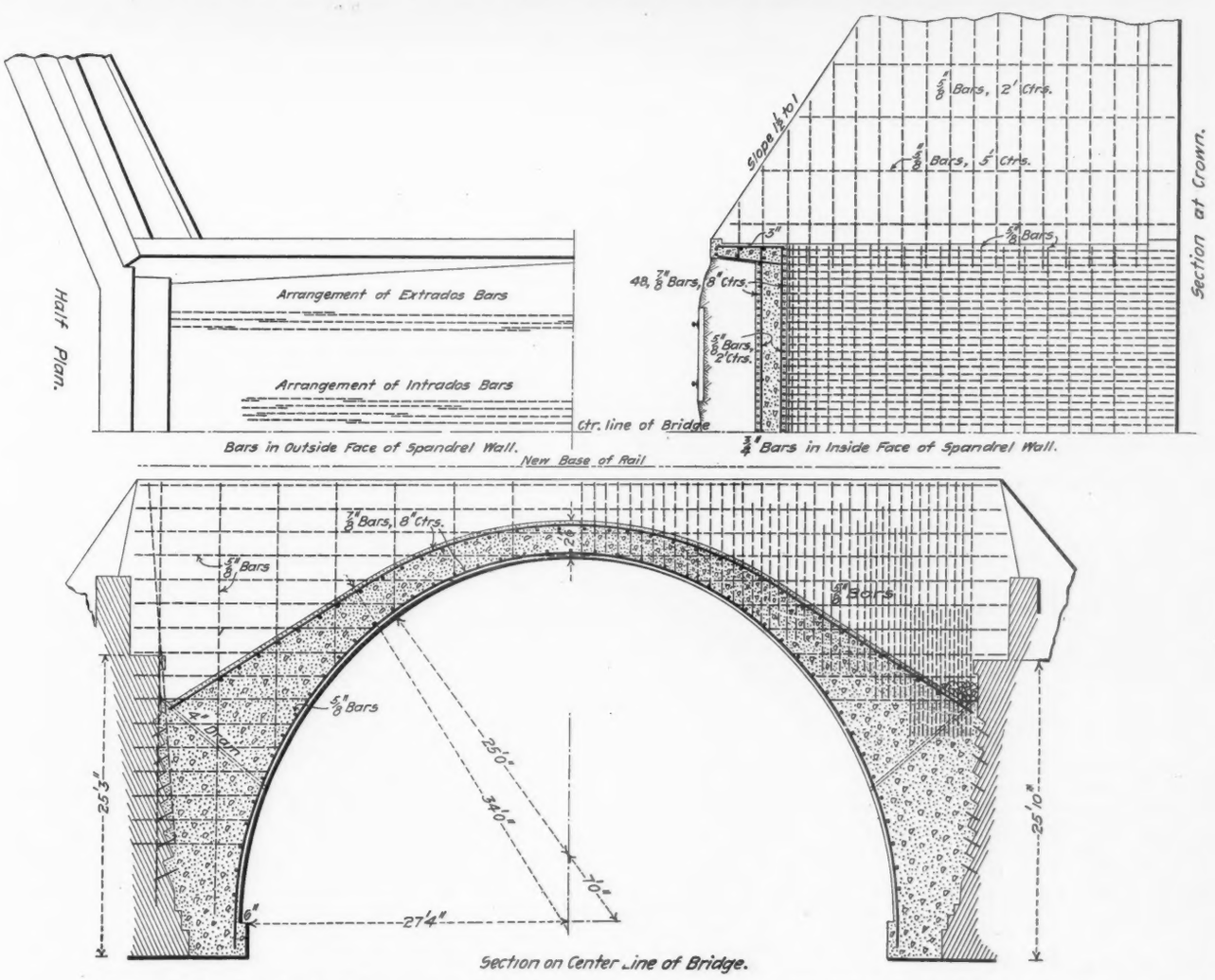


General Plan Showing Reconstruction of Stony Creek Arch—Chicago & Eastern Illinois.

of 6 under live load. As seen by the drawings, the face of each old abutment was notched to give a series of faces to receive the thrust of the arch normally. Steel dowels were inserted in each of these faces.

The wing walls for the new structure are one of the unique features of the work. The old wing walls were reinforced by addition of a thickness of 4 ft. of concrete on their faces, carried up from the foundations to a height conforming with the new fill, in which steel bars were imbedded. This concrete was tied to the old masonry by a large number of steel dowels. This is all clearly shown in the drawings. The plans also show in detail the reinforcing of the structure by Johnson corrugated steel bars, 17½ tons of which were used. The concrete was a 1:5 gravel mixture, the total for the bridge being 1,487 cu. yds. This cost $7.60

New 55-ft. Double Track Reinforced Concrete Arch Over Stony Creek—Chicago & Eastern Illinois

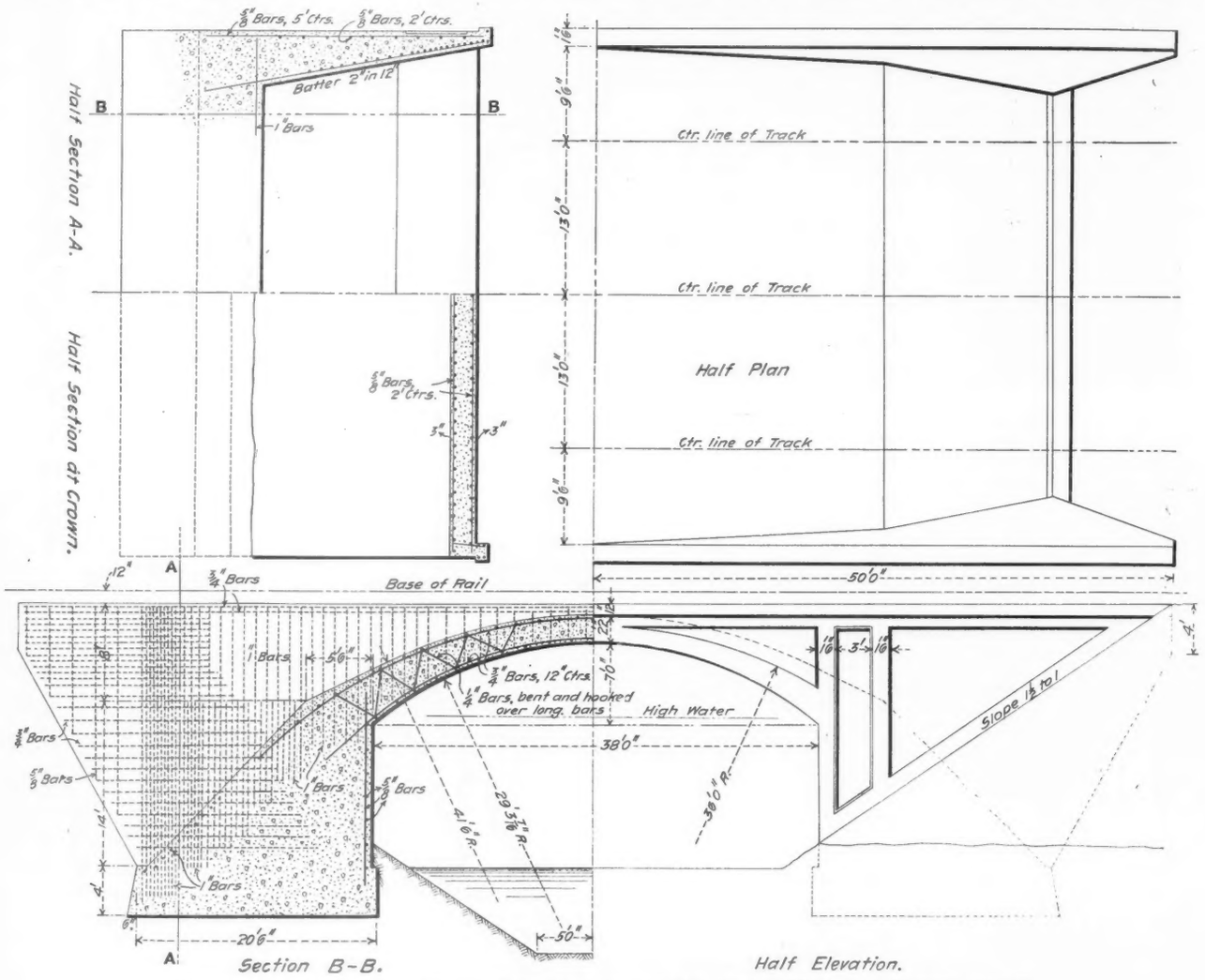


General Plan Showing Arrangement of Reinforcing Bars in Stony Creek Arch—Chicago & Eastern Illinois.

per cu. yd., including the steel reinforcing bars. The total cost was therefore $11,301.

The Trim creek arch is about 39 miles south of Chicago on the three-track line. It replaces a 45-ft. double-track deck-girder bridge, the old masonry for which was removed to make room for an entire new structure. The arch is a flat parabolic type, of 38 ft. span and 2 ft. 2 in. thick at the crown. The barrel is 48 ft. long. The arch is founded on a firm clay, depth of foundation being 27 ft. below base of rail. All details of the design and of the reinforcing by corrugated bars are shown in the drawing. The total amount of concrete was 1,578 yds. and 18 tons of bars were used.

The highway under-crossing shown is about 100 ft. north of the Stony creek arch. The track previously was carried over this crossing on a steel I-beam span. This was replaced by a reinforced concrete slab built between the old stone masonry abutments, the I-beams being blocked up while the slab was being built.



General Plan of 38-Ft. Reinforced Concrete Arch at Trim Creek—Chicago & Eastern Illinois.

These structures were designed by Mr. T. L. Condron, Consulting Engineer, Chicago, under the supervision of Mr. W. L. Dawley, Chief Engineer of the Chicago & Eastern Illinois.

Washington Correspondence.

Washington, April 10.—The beginning of the end of the railroad rate debate in the Senate is in sight. Present indications are that an agreement by substantially all of the Republican Senators upon a form of amendment providing for a judicial review will soon be brought about. It is expected that the President will agree to the incorporation in the review amendment of the provision suggested by Senator Knox giving the reviewing court authority to determine not only whether the order complained of was beyond the authority of the Commission or in violation of the rights of the carrier secured by the Constitution, but also whether it was in violation of rights secured by the laws of the United States. It has been reported to-day that the President has already agreed to this, but it is not admitted at the White House that this is true and the report is probably premature. The so-called conservative Senators are very confident, however, that an agreement will be reached on this basis. The review amendment will then be expanded by incorporation of a provision that is being prepared by Senator Spooner for impounding the amount of the rate in controversy pending the review and for its payment to the carrier or to the shippers in accordance with the final determination of the court. Senator Spooner is endeavoring to so frame this provision that, in the event that an order reducing a rate is finally sustained, the money impounded shall go to the producers of the freight instead of the shippers in cases where the producer is not the immediate shipper. The theory on which he is seeking to do this is that the shipper who buys an article for shipment deducts the amount of the freight from the purchase price that would be paid if the article was purchased at the point of consumption, and that any excessive freight charge is borne by the producer and not by the shipper.

When the question of the form of the review amendment has been decided on the most important task before the Senate will be the amendment of the provision conferring the rate-making power on the Commission so as to remove at least some of the constitutional objections to it in its present form. The opinion of the United States Supreme Court in the Michigan railroad tax cases has served to direct attention sharply to the fact that this provision is certainly unconstitutional in its present form. It might be expected that Senators who do not favor the proposed legislation would rest content to allow the bill to go through in such shape as to insure its being declared unconstitutional and void, but this is not the case. The conservative Senators, who include most of the leading lawyers on the Republican side, will all co-operate in any movement to make the bill constitutional. Even Senator Foraker, who believes that the whole proposition is vicious in principle and that it cannot be made constitutional so long as it is proposed to give the rate-making power to the Commission in any form, will support every proposition tending to remove any constitutional difficulty.

With the exception of Senators Foraker and Morgan and pos-

sibly one or two more, the general opinion among this group of Senators is that it will be possible to fix up the rate-making feature of the bill so as to make it constitutional, and an effort will be made to change it so that it will not require the Commission to apply "its judgment" to the question of a rate and to exercise legislative discretion. Several proposals will be advanced for incorporating in the provision a standard by whose application to a specific freight situation the rate to be fixed can be determined. One of these is the provision contained in the Elkins bill empowering the Commission after hearing, "to make an order directing the carrier or carriers to modify such rate, fare, charge or regulation in such particulars as shall be specified in such order, and if such modifications shall require the change of any rate, fare or charge, the order shall specify the maximum rate, fare or charge that may be put in force by the carrier in lieu of that found by the Commission to be unjust and unreasonable or otherwise contrary to law, but the Commission shall not have power to modify any rate, fare, charge or regulation established by the carrier or carriers to a greater extent than shall be necessary in order to remove the injustice and unreasonableness or other unlawfulness thereof." It is contended that this fixes a definite standard by prescribing the limit below which the Commission cannot go in fixing a rate. It has also been suggested that the amendment proposed by Senator Bailey would fix a standard by requiring the Commission "to determine and prescribe a rate or charge which shall afford a just compensation to the carrier or carriers for the service or services to be performed," it being contended that the provision that the rate shall afford a just compensation fixes a standard by which it can be determined. J. C. W.

A Rational Method for the Introduction and Management of Piece-Work in Railroad Shops.*

BY WILLIAM S. COZAD.
Shop Specialist of the Erie Railroad.

In the management and operation of locomotive repair shops, two distinct and directly opposite methods of paying for work are in general use; one, the day-work or hourly system, which pays each particular class of labor a certain rate per hour, and each workman in that class the same rate regardless of ability, capacity or conditions; the other, a piece-work or piece-rate system, which considers conditions, time, the ability of the workman, and pays for output only.

The day-work method which really is the absence of all system, is adapted to shops where little attention is given to organization; where forces are divided into gangs and each gang with a foreman is given a number of engines or a mixed class of work to do. Where men work on shoes and wedges to-day, rods to-morrow, motion work the next day, and perhaps the next day operate machines, the day rate is probably the only method elastic enough to cover such cases.

Such an organization always results in higher cost for supervision and a much lower rate of individual efficiency than where the efforts of each workman are concentrated in perfecting himself in some particular line of work.

The contract system is well adapted to the requirements of the locomotive boilers, but a failure in repair work. The premium and straight bonus systems are no doubt the ideal thing for manufacturing concerns, but hardly practical for locomotive repairs. Piecework has been stigmatized as "a lazy, haphazard method of shifting responsibility and direction from employer to employee; as working deception in the latter and giving us a long string of broken promises from the former; as hated by unions, as bringing on strikes," etc., but notwithstanding it is gradually growing in favor, and at the present rate of increase, ten years hence will be in practical operation in most, if not all, of the railroad shops of the country.

Price fixing is the difficult problem. Few, if any, foremen who have been trained in the atmosphere of the day shop and have given no particular attention to principles of shop operation or to cost of details, will be able to determine a fair price for a given operation. Prices fixed and put into effect on any other basis than a fair effort on the part of the workman under normal conditions will necessarily have to be changed, and in many cases useless and unfair prices in the past have resulted in more or less bitter feeling against piece-work among workmen. The introduction of piecework requires men of special skill and experience; men who are fully informed as to the capability and physical endurance of workmen, the capacity of machines and the amount of product to be expected from men under certain conditions.

Fourteen months ago on the Erie Railroad we began to work out a piece-work organization in each of the 10 different shops on that road. To thoroughly organize a piece-work system and place it on a sound business basis in each of the different shops, to so conduct the management of the shops that the piece-work principle would appeal to all classes of the workmen as being fair in its application, we have perfected the following organization:

1. The Mechanical Superintendent.
2. The Assistant Mechanical Superintendent.
3. A shop specialist or piece-work expert.
4. The Master Mechanic of each shop.
5. The general foreman.
6. The time-keeping department.
7. A time specialist, with the title of assistant to the general foreman, for each shop.
8. A piece-work checker for each sub-department in shops large enough to justify it; in the small shops two or three departments are combined.

The Mechanical Superintendent finally approves each separate price before it is put into effect.

The jurisdiction of the Assistant Mechanical Superintendent extends in a general way over all shop operations. All appointments of general foreman, gang foremen and piece-work checkers are made by him, subject to the approval of the Mechanical Superintendent, recommendations for such appointments being first made by the different Master Mechanics.

The shop specialist reports to and receives instructions from the Mechanical Superintendent. All piece-work schedules are made and records kept in the office of the shop specialist.

The assistant to the general foreman is the man upon whom rests the responsibility for fixing the time upon which all piecework prices are based. He is in many respects the most important factor in the entire piece-work organization. No piece-work expert, I care not how proficient he may become in the business, can handle all the details of rate fixing on a large railroad without relying more or less on the judgment of the man who makes the recommendations from personal observation of the work.

These positions are made attractive both in point of salary and in placing men in line for promotion to roundhouse foreman, general foreman, Master Mechanics, etc., and we aim to select the best young men in the service for this work.

The piece-work checkers in the different departments each perform exactly the same duties, which consist in carefully checking over the time and work of each employee who is paid by the piece. We depend largely, but not entirely, on these checkers to see that accurate division is made between day and piece-work time, and that the labor on the number of operations turned in by each workman is actually and accurately done. They report to the assistant to the general foreman all inaccuracies that may arise in the practical application of the schedules, also all operations of frequent recurrence in their respective departments which have no piece-work price.

The Master Mechanic and general foreman of each shop have the same general control over all the details of piece-work that they exercise over the shop in general. The Master Mechanic is held responsible for the output of his plant and reports to the Assistant Mechanical Superintendent in charge of shop operations on all matters pertaining to shop machinery and output, and to the shop specialist on all matters pertaining strictly to piece-work and piece-work prices.

The time-keeping department varies little from that of the ordinary day work shop, the only practical difference being that, instead of keeping all straight day work time, the same clerks keep part day-work and part piece-work time. No increase in the time-keeping force is necessary in a shop on account of the introduction of piece-work.

The card, form 2351, Fig. 1, used by the assistant to the general foreman in timing operations, calls for all the essential information necessary in price fixing. It is 4 in. x 6½ in., a convenient size for the pocket. The assistant to the general foreman is to note anything which would in any way affect the price, whether called for by the card or not, and this he does, under the head of "Remarks" or on the back of the card. As these cards are made out, they pass through the hands of the general foreman and, if satisfactory to him, are turned over to a typewriter, who makes out, in duplicate, card, form 2195, Fig. 2. These cars are then signed by the shop officials, as indicated thereon, and sent in to the general office of the mechanical department, where they are checked and signed by the shop specialist, the Assistant Mechanical Superintendent, and approved by the Mechanical Superintendent. After these cards are approved by the Mechanical Superintendent they are turned back to the office of the shop specialist and entered in the piece-work schedules (see Fig. 5), the schedule number placed in the upper left-hand corner (see Fig. 2), the original card filed in the file case, and the duplicate returned to the Master Mechanic as his authority to put the price into effect. When the duplicate is received by the Master Mechanic, it is entered in the schedule oposite the schedule number which it bears (see Fig. 2, upper left-hand corner), and filed in a case exactly like the one in the office of the shop specialists.

The piece-work card (Fig. 3), is used by the piece-work checkers in all departments of the shop in making a record of the operations and time of all piece-workers. A record is made each

*Read before the New England Railroad Club.

day of the piece-work completed by each workman, and when the cards are full of items, or a certain amount of work is completed, they are totaled by the piece-work checker, properly signed and turned in to the general foreman's office, from which place they are sent to the time-keeping department.

The daily record cards (Fig. 4) are for the use of the workmen. They are delivered to employees as they enter on duty in the morning. They make a record of their day's work and deposit the cards in box at night. Changes from day work to piece-work, or *vice versa*, are recorded on these cards by the gang foreman in charge of the workmen. When these cards have been checked in the general foreman's office, they are turned in to the time keeping department and checked against the piece-work cards (Fig. 3), to see if differences exist in the two records.

The piece-work schedules (Fig. 5), are all made up in the office of the shop specialist and sent out to the Master Mechanics to be put into effect. They are bound in Shipman's cloth binders, and make a neat book. These schedules are put in the hands of the checkers and gang foreman and otherwise distributed about th shop so that the workmen and all concerned can have free access to them.

We attribute the marked degree of success which has rewarded our efforts in the extension of the piece-work principle to the different shops of the Erie within the past 14 months to the perfectly free, honorable and open way in which we have placed the entire subject before our men.

If, on account of changes in conditions, or for any other reason it is necessary to alter a rate, the change is made in precisely the way in which new prices are fixed. After the change is approved by the Mechanical Superintendent, the duplicate card is returned to the Master Mechanic through the office of the shop specialist and price in shop schedule is changed to agree with the card. Our men know just what we are doing all the time. Our time specialists have received positive instructions not to time operations for the purpose of fixing piece-rates without the workman knowing for what purpose time is being taken. The old way was to get the employee on a "hurry-up" job, take the time in secret, deduct 25 or 30 per cent. and then fix the rate on the remainder—much on the same principle as an Indian would shoot his victim from ambush.

In the two or three shops of the Erie which have worked more or less piece-work for several years, we have found it necessary within the past year to make changes in the prices on hundreds of different operations. We do not say to our men that we will not change prices. We do not make promises to-day which we know will be broken to-morrow. What we do say is that we will not change a rate unless we can give a good and sufficient reason for it; and when the rate is changed, it will be so fixed that an honest effort on the part of a competent workman will be rewarded by a substantial increase in earnings over his day rate.

Thirty-three per cent. of the total earnings of all men employed on general locomotive repairs on the entire road are now on a piece-work basis. In the car department 56 per cent. of the freight and 92 per cent. of passenger repairing is piece-work. Besides this we also pay piece rates on a large part of the work of our heavy repair gangs in the roundhouses. Our engine wiping is all piece-work. We knock all fires, shovel all cinders, and handle all coal at fixed prices for each separate operation. Since the workmen have become thoroughly familiar with our methods of fixing rates, we have met no opposition whatever in the extension of the work,

Form 2231—6, 1905—3m.

ERIE RAILROAD COMPANY.

Shop_____ Date_____

*Description of Operation and Material*_____

*Machine*_____ *Time Started*_____ *Time Finished*_____

SPEED		FEED PER REV.		TIME-MINUTES		TIME-MINUTES		Time to Change and Grind Tools	Total Time Minutes	Pattern Number	Class of Engine
Rough Cut	Finish Cut	Rough Cut	Finish Cut	Rough Cut	Finish Cut	To Set	To Remove				

*Name of Workman*_____ *Day Rate*_____

*Remarks:*_____

Assistant to Gen'l Foreman.

Fig. 1.

Schedule No._____ ERIE RAILROAD COMPANY Form 2183—6, 1905—10m.

RECORD OF OPERATIONS FOR ESTABLISHING PIECE WORK PRICES.

SHOP	DATE	CARD NUMBER	PATERN NO. OR SHAPE NUMBER	CLASS ENGINE OR CAR

MACHINE	SHOP NO.	TOOL STEEL	MATERIAL	

DESCRIPTION OF OPERATION.

TIME SETTING	TIME MACHINING	TIME REMOVING	TOTAL TIME	ROUGHING CUTS			
				SPEED	FEED	DEP. H	NO.

FINISH CUT		NO OF PIECES	OPERATIVE	RATE	COST PER PIECE	PRICE RECOMMENDED
SPEED	FEED					

Piece Work Inspector or Foreman. _____ *General Foreman.*

Remarks:_____

Approved.

Master Mechanic. *Shop Specialist.* *Asst. Mech. Supt.* *Mech. Supt.*

1905—

Fig. 2.

Card No._____

ERIE RAILROAD COMPANY.

PIECE WORK CARD.

Shop_____ 190__

Charge to	Schedule	No. Pieces	Price	Cost

DISTRIBUTION

DATE AND HOURS LABOR PERFORMED

Number | Name of Workman | Date | HOURS | Total Hours | Day Rate | Earned Piece Work

Piece Work Checker. *Foreman.*

Fig. 3.

ERIE RAILROAD COMPANY.

PATTERN OR SHAPE NUMBER	SCHEDULE NUMBER	NAME OF PART AND DESCRIPTION OF OPERATION	PRICE

Fig. 5.

No._____ ERIE RAILROAD COMPANY. Form 2443 A—10, 05—20m

*Daily Time Record of*_____ *Shop*_____ *Date*_____ 190__

CHARGE	PIECE WORK		DAY WORK		HOURS	DESCRIPTION OF DAY WORK
	COMMENCED	FINISHED	COMMENCED	FINISHED		

*Correct:*_____ *Foreman.*

Fig. 4.

Time and Cost Cards Used in Connection With the Piece Work System at the Erie Shops.

and our inability to rapidly change conditions, cut out bad practices, and install proper tools and facilities for making repairs in the most economical way are now the only obstacles which prevent a more rapid extension of the piece-work principle.

On the machine side of our shops operations are classified and certain machines do certain kinds of work. Our prices are, therefore, in many instances based on single machines, and if the work is changed to some other machine, we, of course, reserve the right to change the price. Each shop on the system is placed strictly on its own merits. As a whole, the schedules made for one shop are never put into effect in another shop. However, where conditions and day rates are the same, we frequently send prices on certain operations that have been carefully and accurately timed in one shop, to other parts of the road to be put into effect after the Master Mechanic and his official force are satisfied they will meet local requirements.

The piece-work system properly applied benefits alike employer and workman. Honestly administered, it offers greater possibilities for increasing earnings than any other method of remunerating labor. Under it, where time is honestly and faithfully applied in the interest of the concern by which workmen are employed the reward will be proportionate to the effort.

GENERAL NEWS SECTION

NOTES.

April 16 is the day set for the opening of navigation on Lake Michigan.

It is announced that the Central of Georgia will increase by 15 per cent. the pay of telegraph operators.

The Grand Trunk Railway of Canada is said to have acquired large tracts of coal lands in Nova Scotia.

The Minneapolis, St. Paul & Sault Ste. Marie now issues a mileage ticket for 5,000 miles at two cents a mile, "flat."

The legislature of Maryland, which has adjourned, passed a bill limiting all passenger rates to two cents a mile, but the Governor is going to veto it, they say.

The Governor of New Jersey has signed the Perkins bill, under which "first-class" railroad property is to be taxed at local rates, largely increasing the tax burden on all of the railroads.

By a law which has been recently passed electric railroad companies in New Jersey may now carry freight through those cities and towns which, by ordinance, grant permission to do so.

A press despatch from St. Paul tells of 9,000 home-seekers going west and north from that city in a single week. The number of cars of emigrants' movables sent forward from St. Paul is about 1,000 a week.

Chicago papers report that all of the railroads carrying grain either to or from that city have agreed to abolish the switching charge on grain delivered to elevators away from their own tracks, and have also agreed to grant milling-in-transit privileges.

On the Wyoming division of the Union Pacific an order has been issued requiring copies of train orders to be delivered to the head brakeman of each train. On passenger trains the head brakeman must show his copy to the flagman. On freight trains the conductor must show his copy to the rear brakeman.

On the night of April 8 the Twentieth Century Limited express of the Lake Shore & Michigan Southern was run from Cleveland to Toledo, 108 miles, in 99 minutes, or at the rate of 65½ miles an hour, and it is said that a speed indicator in one of the cars indicated, near Vermillion, a rate of 96 miles an hour. The number of cars is not given, but the train usually has six, we believe.

The suit which was brought in behalf of the Dearborn station, at Chicago, to compel the Chicago & Eastern Illinois to continue using that station has failed; the Supreme Court of the United States refusing to take up the question. The C. & E. I., since it came under the control of the Rock Island, runs its passenger trains to and from the Rock Island (La Salle street) station.

The Massachusetts Legislature has passed a law giving the State Railroad Commission authority over the doings of express companies as follows: "The Board of Railroad Commissioners may, upon the complaint of any party interested, exercise over express companies, partnerships and individuals doing an express business upon the railroads or railways in this Commonwealth supervisory power with regard to the character of accommodations, service and the reasonableness of rates."

The legislature of Massachusetts has passed a bill modifying the law relative to safeguards against fire by striking out the limitation of such safeguards to cars "in which heating apparatus may be placed," and by changing the word "approve" to "order," so that the law now reads as follows: "Every passenger, baggage, mail and express car, which is owned or regularly used on any railroad in this Commonwealth, shall be provided with such safeguards against fire as the board [of railroad commissioners] in writing shall order. A corporation which violates the provisions of this section shall forfeit three hundred dollars for each offence."

Annual Meeting of the Technical Publicity Association.

At the second annual meeting and banquet of the Technical Publicity Association held April 5, at the Aldine Association, New York, these officers were elected: President, F. H. Gale, General Electric Co.; First Vice-President, H. M. Cleaver, Niles-Bement-Pond Co.; Second Vice-President, C. B. Morse, Ingersoll-Rand Co.; Secretary, Rodman Gilder, Crocker-Wheeler Company; Treasurer, H. M. Davis, Sprague Electric Co.; members of Executive Committee, Robt. L. Winkley, Pope Mfg. Co., and G. M. Basford, American Locomotive Company; members of Election Committee, C. W. Beaver, Yale & Towne Mfg. Co.; Chas. N. Manfred, Johns-Manville Co., and H. H. Kress, A. S. Cameron Steam Pump Works. P. F. Kobbé, former President of the Association, and now an advertising specialist, was the guest of the evening. He gave an address on the general subject of advertising. An informal discussion followed. The other companies represented at the banquet were: American Wood Working Machinery Co., *Railroad Gazette*, John A. Roebling's Sons, De La Vergne Machine Co. and A. A. Griffing Iron Co. Richard S. Chisolm, of the *Railroad Gazette*, in a speech declared that investigation of circulation would be of the greatest value, not only to members of the Association but to reputable magazines also. Membership of the Association shows a steady increase, and its finances are in good condition. The following resolution was unanimously passed: "Resolved, That the Association take active steps to secure definite information regarding the circulation of mediums in which members of the Association are interested."

The Block System in Massachusetts.

The bill empowering the State Railroad Commission to order the installation of block signals has passed both houses of the Massachusetts legislature, so that, unless there is a veto from the Governor, Massachusetts will be the first state in America to make this requirement by law.

Washington Union Station.

The new union station at Washington, D. C., may now be said to be half done, and one track is completed on the connection northeastward to the Philadelphia, Baltimore & Washington road at Magruder. Next Tuesday an officers' inspection train will be run over this connecting line. The excavations on the Patterson hill at Eckington are finished. The bridges over the streets south of Florida avenue are approaching completion. Work on the station building has been carried on rapidly through the winter, and the east end and the south front are well advanced. The arched frame of the roof in the rear of the main structure is in place over about half of the 850 ft. of the station's width.

The stone courses of the outer walls of the entire structure are about finished to the first story, and derricks are being raised to begin work upon the imposing south front of the building. The building should be sufficiently advanced for the use of a part of it for the accommodation of passengers by next spring. It is said to be the intention to make use of the east end for this purpose, while the west end is being completed, thus permitting the removal of the present temporary tracks by which the Baltimore & Ohio trains enter the old station.

One drift of the tunnel under Capitol Hill is now at a stage which allows material to be carried in from the north end. In and about the station 500 men are now employed, and to these forces 100 or 200 will soon be added.

The Pennsylvania freight station in South Wasington and the elevated tracks in that part of the city will be finished long before the tunnel. Ground has been broken for the extensive yards and shops of the Pennsylvania, the Southern and the Chesapeake & Ohio south of the Potomac.

New York City Rapid Transit.

The legislature of New York has passed the Elsberg bill, amending the law governing rapid transit in New York City. The principal purpose of this bill is to give the Rapid Transit Commissioners more latitude in letting contracts. It permits the separation of the contracts for construction, equipment and operation, unless the Board of Estimate and Apportionment declares that it is practicable, expedient and required by the public interest that the contracts should be let jointly, in which event the rapid transit commission is authorized to exercise its discretion to so let them.

From the possible separation of the contracts it is expected that competition will come, or, at any rate, that the possibility of competition will exist.

Power is reserved to the city to construct for itself and to equip for itself, and, as a last resort, to operate if that should be absolutely necessary. If a contract for operation is awarded to a private bidder, the operating term—if the contractor equips at his own expense—is cut down from 75 years to 40 years. Under the existing law the term is 50 years, with a 25-year renewal. Under the Elsberg bill the term is 20 years, with 20-year renewal. If the operating contractor does not equip at his own expense, then the maximum term under the new bill is 21 years, that is, 10 years with a 10-year renewal. The power of the rapid transit commission given to it

under the existing law to grant perpetual franchises is absolutely taken away.

Provision is made that in the future pipe galleries shall be built in connection with new subway roads, and that such pipe galleries shall be open to the use of any one on fair terms.

The self-perpetuating feature of the rapid transit commission is abolished, and hereafter when vacancies occur in that commission they will be filled by the Mayor.

The Coal Strike.

In the bituminous regions, following the concessions of the operators, work has been very generally resumed in the mines, and suspensions of employees and other retrenchments ordered by the railroads have been largely revoked. On the Pennsylvania Railroad the track repair men were reduced to 25 hours a week throughout the main line, but on April 10 an order was issued restoring full time.

In the anthracite regions the mines with few exceptions continue idle, and the negotiations between the operators and the committee of miners are still going on. The result up to the time of this writing is embodied in a proposal which was made on Tuesday of this week by the representatives of the operators to Mr. Mitchell and his committee, as follows:

The members of the Anthracite Strike Commission, or such of them as may be able and willing to act (not less than a majority of the whole number) shall be requested to decide whether any changes in the conditions of the anthracite industry have occurred since the award of the Anthracite Coal Strike Commission, which requires that the award should be modified, as to the following subjects, and, if so, what that modification shall be.

First. As to wages or rates of payment of the employees, either by way of increase or reduction.

Second. As to adjustment of complaints through the conciliation board or otherwise.

Any party so desiring shall present his claim in writing to the commission, stating the same in detail.

Work shall be resumed at once. The award shall be effective from April 1, 1906, and the present award of the commission with any modification thus made shall continue in effect until March 31, 1909. Three years are suggested, because that time has been found satisfactory in the present case, and also because this would avoid introducing into purely business questions the political considerations of a Presidential campaign.

The members of the commission shall be paid such compensation for services and expenses as may be fixed by themselves. The operators shall furnish one-half of the same and your committee shall furnish the other half.

The proposition was signed by George F. Baer, W. H. Truesdale, J. B. Kerr, David Willcox, Morris Williams, E. B. Thomas and J. L. Cake, the latter representing the independent operators.

The following are the members of the Anthractie Strike Commission:

Judge George Gray, United States Circuit Court, Wilmington, Del.

Carroll D. Wright, president of Clark College, Worcester, Mass.; formerly Commissioner of Labor.

Brigadier-General John M. Wilson, United States Army, Washington, D.C.

Bishop John L. Spalding, Peoria, Ill.

Edgar E. Clark, grand chief conductor, Order of Railway Conductors of America, Cedar Rapids, Iowa.

Thomas H. Watkins, formerly an independent coal operator, now a soft-coal operator, Scranton, Penn.

Edward W. Parker, expert statistician, Washington, D. C.

Of these all are in good health except Bishop Spalding. When the commission was originally appointed an appropriation of $50,000 was made by Congress for its maintenance.

Philadelphia papers report that the Reading road has taken out of service 135 freight locomotives.

New B. & O. Pier at Locust Point.

Work on the substructure of the new freight pier of the Baltimore & Ohio under construction at Locust Point, is well under way, and the McLean Construction Company, which has the contract, expects to finish this part of the work in August. Plans for the superstructure have been completed, and bids are being asked for. This new pier will be one of the largest and best on the Atlantic coast, and will be known as new pier No. 8, taking the place of old piers Nos. 6, 7, 8 and 9, which will be removed. The new pier will be two stories high, and will have a total floor space of 300,000 sq. ft. It will rest on about 10,000 piles, averaging 60 ft. long. On the floored pile foundation concrete piers will be built under the building columns. The frame will be of steel, about 2,000 tons being required, and it will be covered with galvanized corrugated iron. The second floor will be carried on heavy timber joists resting on steel girders. The flooring will consist of an underfloor of pine, with a finished surface of maple, which has been found to be the most economical for trucking floors. The roof will be of composition, and the skylights and windows of wired glass. The building will have eight large elevators, four barrel hoists and four traveling cranes. The cranes will travel on a single rail set in the first floor and have an overhead guide. The elevators and cranes will be operated by electricity. Special attention has been paid to meeting the views of the fire underwriters. The building is to be completely equipped with high-pressure water pipes and hose, and also have a fire wall across the center of the building. The pier will have berth space for three of the largest vessels. The export and import business at Locust Point is now very heavy. With elevator capacity for about 2,250,000 bushels, it has frequently occurred recently that over 2,000,000 bushels was on storage. Of corn, there is now about 1,200,000 bushels. The pier now under construction is the second to be finished under the general improvement policy which the company is pursuing at Locust Point. The first was pier No. 9, built about a year ago, and which is designed for handling immigrant business.

Projected Government Railroad in Canada.

As a result of the success of the Temiskaming & Northern Ontario, the Ontario Government has decided on further government railroad building. If a more complete survey justifies the expectations as indicated by the preliminary reports a line will be built from Cobalt to Sudbury, where connection will be made with the Canadian Pacific. The proposed line will traverse a rich mineral and forest section.

Equipment for Egyptian Railroads.

The Egyptian Government is planning to spend a large amount of money to improve its railroads, and many locomotives and passenger and freight cars will be added. The locomotives will come from England, but there is a possibility that the passenger and freight cars may be ordered in the United States. The manager of the road is J. H. L'E. Johnstone, to whom all inquiries should be addressed at Cairo, Egypt.—*Consular Report.*

Increase in Fares on Intercolonial.

There has been an increase in passenger rates on the Intercolonial Railway, owned by the Canadian Government, of about 5 per cent. The new schedule provides for a charge of 3 cents a mile for any distance from 1 mile to 200 miles. Previously the 3-cent rate was only up to 100 miles, and from 101 miles upward on a graduated scale. There is a charge, from 201 to 300 miles, of 2.7 cents per mile, and a gradual reduction on each 100 miles up to 1,000, when the rate is 2 cents. For commercial travelers the rate will be 2¼ cents, instead of 2 cents as now, and the 1,000-mile ticket is also advanced from 2 cents to 2¼ cents per mile. These rates, it is stated, are still lower in most cases than those on the Grand Trunk and Canadian Pacific. The Intercolonial Railway has never been a paying institution.—*Consular Report.*

Inspection of Engine Brakes.

At the February meeting of the Canadian Railway Club, Mr. A. B. Brown, of the Westinghouse Air Brake Co., read a paper on Inspection and Repairs of Engine Brakes in Engine Houses. He urged that the condition of the brakes as well as the character of the work done should be reported to the general air brake inspector on a suitable blank, form for which was recommended. Mr. Brown proposes that all defects shown on this form shall be repaired in the engine houses, except those having a small star opposite. Loose nuts upon the air end of main piston rod belong to this category, and, therefore, except in an emergency, must not be tightened up in engine house, but, instead, the pump should be replaced and sent to the shop where facilities are available for making proper repairs.

Railroad Building in Mexico.

President Diaz, in his message to Congress, sums up the railroad situation in that country as follows: For the past six months the new railroad built aggregated 190 miles. The names of the companies building were: Kansas City, Mexico & Orient; Pan-American, and Cananea, Rio Yaqui & Pacific. The government railroad system aggregates 10,735 miles. On the Mexican Central extension between Tuxpan and Colima a tunnel about 500 ft. long and a bridge with a span of about 300 ft. has been completed.

Manufacturing and Business.

James Rawle, of Bryn Mawr, Pa., has been elected President of the J. G. Brill Co., to succeed the late G. Martin Brill.

The Capitol Lock-Nut & Washer Co., Columbus, Ohio, has opened an office in Chicago at 960 Monadnock Building, with C. L. Wolfersberger in charge.

Fairbanks, Morse & Company have appointed S. F. Forbes, formerly Purchasing Agent of the Rock Island, to a similar position with their company, with headquarters at Chicago.

J. C. Mitchell, formerly with the Atlas Engine Works, Indianapolis, Ind., has accepted a position in the sales department of the Dayton Pneumatic Tool Co., with headquarters at Dayton, Ohio.

The new 30-stall roundhouse of the Southern Railway at Atlanta, Ga., is being equipped with a complete heating and ventilat-

ing system, consisting of fan and steel pipeheater, furnished by the B. F. Sturtevant Co., of Boston, Mass.

The street car lines in Bahia, Brazil, are being converted into electric lines. This involves about 65 miles. Negotiations in regard to contracts are being carried on by M. T. Guinle, who may be addressed, care of the General Electric Co., 44 Broad street, New York. Five thousand tons of rails for the new line have been ordered from the Lorain plant of the United States Steel Corporation.

General Eugene Griffin, First Vice-President of the General Electric Company, sailed from New York on April 10 on the steamer "Graf Waldersee," to make an extended trip in England and on the continent, largely for rest and recreation. As he is a director in the Cie Francaise Thomson-Houston and Vice-Chairman of the British Thomson-Houston Company, these interests will naturally claim a portion of his time.

G. Martin Brill, President of the J. G. Brill Company, died suddenly on March 31st at his home in Merion, Pa. Up to the time of his death Mr. Brill had been enjoying the best of health and every day found him the same energetic man of business. He was born in Hesse Cassel, Germany, in 1846, and was the eldest son of John George Brill, who came to America in 1847, settling in Philadelphia, where he soon became employed by the firm of Murphy & Allison, street car builders. It was not long before the son adopted his father's trade, for soon after his school days he began work in the same company, and for a number of years was foreman of its woodworking department. After the plant was destroyed by fire in 1868, Mr. Brill and his father took hold of the business that their employers had discontinued, and established the firm of J. G. Brill & Son. In 1888 Mr. Brill's father died. The present plant was fashioned after Mr. Brill's own ideas, and his genius and enterprise are evidenced in its every department. Very thorough in everything he undertook, so he trained his men to be likewise. He was of a very kindly disposition, large in mind and heart, and his many friends will feel his loss keenly. In the business world he was regarded as a very capable organizer and director of affairs, and all his dealings were governed by the highest principles. Nearly 100 patents have been issued to him on cars and trucks. He was a member of the Manufacturers' Club of Philadelphia, the New York Club, the Union Club of Cleveland, the St. Louis Club, and a Director of the Merchants National Bank, of Philadelphia, and of the Interstate Railway Company.

G. Martin Brill.

In connection with the electrification of the Nankai Railroad, a 50-mile private line in Japan, rails, cars and motor equipment are to be ordered through the three principal Japanese contracting houses: Mitsui & Co., Silk Exchange Building; Takata & Co., 10 Wall street, and Okura & Co., Bowling Green Building, New York City. The contract for the electrical equipment of the power house will include Westinghouse generators and McIntosh-Seymour engines.

T. George Stiles, of Arlington, N. J., writes: "In your issue of March 30th, describing the interlocking at Roseville, N. J., you have printed a cut of our Universal single and double deck pipe carriers which are designed, patented and manufactured by the writer, without giving any intimation that they are a patented article. This is liable to lead us and others into trouble and litigation. We are not looking for free advertising, but your readers should be informed that these pipe carriers are protected by United States patent. This would not have been necessary had the word 'Patent' been used on the cut."

At a meeting of the Board of Directors of the Westinghouse Electric & Manufacturing Company held Tuesday, April 10, L. A. Osborne, formerly Third Vice-President of the company, was elected Second Vice-President to succeed Frank H. Taylor, resigned. Mr. Taylor, who is also a Director of the company, will retain his seat on the Board. Mr. Osborne's duties as Third Vice-President comprise the direction of the engineering and manufacturing activities of the company. As Second Vice-President he will assume the direction of the commercial branch while retaining those of the Engineering Department. The new Second Vice-President is a graduate of Cornell University, and entered the employ of the Westinghouse Electric & Manufacturing Company in 1891, and has successively held the positions of Assistant Superintendent, Assistant to the Vice-President, Manager of Works, Fourth Vice-President and Third Vice-President.

Iron and Steel.

The output for March of the United States Steel Corporation was the largest in the history of the company.

The Tonopah & Goldfield has given a contract for 8,000 tons of rails, bringing its orders since April 1 up to 14,000 tons.

The American Bridge Co. is making at its Elmira, N. Y., and Ambridge, Pa., works 50,000 tons of bridge material for some 200 bridges on the projected Seoul-Wiji railroad in Korea.

Orders for rails for the past week have been somewhat small, aggregating only 36,000 tons. The Baltimore & Ohio has ordered 2,000 tons additional, and the Philadelphia Rapid Transit 500 tons.

The combined sale of rails for 1906 delivery already aggregate 3,100,000 tons, which is more than the combined output of all the producers during last year. Negotiations are pending for an additional 200,000 to 250,000 tons.

The American Bridge Co. received contracts for 60,000 tons of fabricated steel during March. This was the largest in the history of the company, and exceeds the next highest record, which was March, 1901, when the orders aggregated 54,000 tons.

The United States Steel Products Export Company, New York, the export company of the United States Steel Corporation, has a number of contracts in hand for rails to be used in building electric roads in Europe and South America. The British affiliation of the New York engineering and contracting firm of J. G. White & Co., which was recently awarded the contract by the London County Council for building 22½ miles of railroad in the northern portion of the British metropolis, is to use Lorain rails. The Glasgow corporation has also requisitioned for Lorain special work to be carried out in the extension of the tramways in that city.

OBITUARY NOTICES.

Wilhelm Bork, one of the most accomplished railroad engineers in Germany, a member of the Berlin directory of the Prussian State Railroads, in which he had charge of the locomotive service and of the experiments in electrical traction, died March 9, in his 63d year. Mr. Bork was the son of a locksmith, learned his father's trade and two others also, by his own exertions obtained an engineering education, and at a very early age distinguished himself in bridge construction. Even after that time he served as locomotive engineer and in train service, and so qualified himself as an operating officer. Of late years he was especially active in electrical railroad operation, on the street railroads and elsewhere.

Henry W. Parkhurst, until recently Engineer of Bridges and Buildings of the Illinois Central, died in Chicago, Sunday, April 8. His death was the result of a severe accident sustained on February 20 at the Illinois Central suburban station of Windsor Park, Chicago. Mr. Parkhurst was born in Boston, Mass., in 1847. His early life was spent in Providence, R. I., and he graduated from Brown University in that city in 1869. His professional work was begun in the office of a civil engineer in Providence, but the following year he took up railroad work, being engaged on the double-track work of the Providence & Worcester Railroad. In 1871 he went West to become Assistant Engineer under Mr. E. L. Corthell on the Hannibal bridge over the Mississippi river. He was associated with Mr. Corthell for a number of years, being Resident Engineer of the Sny Island Levee, 50 miles long, in Illinois, opposite the towns of Hannibal, Louisiana and Clarksville, Mo.; and Resident Engineer on the Louisiana, Mo., bridge over the Mississippi; after which he was engaged with Mr. Corthell on work connected with the South Pass jetties of the Mississippi river. For several years following this he was engaged on railroad construction work, being Division Engineer on the construction of 45 miles of the extension of the Chicago & Alton to Kansas City and Chief Engineer of Construction of the St. Louis, Keokuk & Northwestern from Hannibal to Clarksville, Mo. He next became associated with the late Mr. Geo. S. Morison, first as Resi-

H. W. Parkhurst.

dent Engineer of the Glasgow, Mo., bridge of the Chicago & Alton, then as First Assistant Engineer of the Plattsmouth, Mo., bridge from November, 1879, to the end of 1880; on the Bismarck, N. Dak., bridge from January, 1881 to June, 1882, and finally on the Blair Crossing bridge from June, 1882, to November, 1883.

In 1883-4 Mr. Parkhurst was engaged in surveys for a railroad in Venezuela, South America. The railroad was never built, however, as a similar concession had also been granted to a French company. Returning to the United States, Mr. Parkhurst was Assistant Engineer in charge of foundations of the Omaha bridge over the Missouri river for a few months in the latter part of 1885. In December of that year he met with an accident which resulted in the amputation of his left leg above the knee, obliging him to change his professional work more to office duties. However, he was able later to take charge of the construction, under Mr. Morison, of the Merchants' bridge at St. Louis, living there from 1889 to 1891. The following year he entered the service of the Illinois Central as Engineer of Bridges and Buildings, his title for part of the time, however, being Engineer of Construction. During the 14 years that he was with that road he designed and built the Burnside, Water Valley, Waterloo and Memphis shops; the Stuyvesant docks, elevators, wharves, etc., at New Orleans; rebuilt the La Salle, Dubuque and Tennessee river bridges, and helped carry out track elevation and depression work, and bulkhead work on the lake front, Chicago. He also designed and built some notable reinforced concrete bridges, the most remarkable being the Big Muddy bridge near Carbondale, Ill., which is a three-span, 140-ft. elliptical arch, double-track structure. For the past few months Mr. Parkhurst has been engaged in consulting engineering work in Chicago. He was a member of the American Society of Civil Engineers and of the Western Society of Engineers, being a past-president of the latter association. He was also a charter member of the American Railway Engineering and Maintenance of Way Association.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Rock Island Company.—H. C. Frick has resigned from the Board of Directors.

Union Pacific.—A. J. Earling, President of the Chicago, Milwaukee & St. Paul; David Wilcox, President of the Delaware & Hudson, and Robert Goelet, have been elected directors, succeeding Jacob H. Schiff, James H. Hyde and Otto Kahn.

Operating Officers.

Chicago, Milwaukee & St. Paul.—J. A. Macdonald, Superintendent at Mendota, Ill., has been transferred to Ottumwa, Iowa, succeeding E. Laas, promoted. W. H. Molchior, Trainmaster at Savannah, Ill., succeeds Mr. Macdonald.

Evansville & Terre Haute.—J. O. Crockett, who was recently appointed General Manager, was born in Indiana in 1868. His first railroad service was in 1885 as a messenger on the Pennsylvania Lines. From 1889 to 1894 he was Train Despatcher on the Richmond division, after which he was transferred to Terre Haute, where, after six years, he was appointed Chief Despatcher. In 1902 he was Superintendent of the Peoria division, and in 1903 Superintendent of the Terre Haute & Logansport and of the Logansport & Toledo divisions of the Pennsylvania Lines. In 1904 he went to the Chicago, Rock Island & Pacific, and was made Superintendent of Telegraph and Mails. He was made General Superintendent of the Southwestern district of that company later in the year. In August, 1905, he was appointed Superintendent of the Evansville & Terre Haute and of the Evansville & Indianapolis, where he has remained until his recent promotion.

Pennsylvania.—H. M. Carson, who was recently appointed Assistant to the General Manager, was born in Baltimore, Md., in 1867, and graduated from Lehigh University in the class of 1889, having taken the mechanical engineering course. He immediately began railroad service as an apprentice in the Altoona shops of the Pennsylvania, and has remained with that company ever since. In 1893 he was appointed assistant road foreman of engines of the Philadelphia division, and two years later was made Assistant Engineer of Motive Power at Altoona. In 1900 he was promoted to be Master Mechanic of the Pittsburg division, and the next year was made Superintendent of Motive Power of the Buffalo & Allegheny Valley division, in which position he served until April 1 of the current year.

Traffic Officers.

Lehigh Valley.—J. S. Wood, Division Freight Agent at Buffalo, has been appointed Assistant General Freight Agent, with office at New York, effective May 1, succeeding H. C. Burnett, promoted.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—W. F. Buck, Master Mechanic at Needles, Cal., has been appointed Mechanical Superintendent of the Eastern Grand division, with office at Topeka, Kan., succeeding F. N. Risteen, deceased.

Beaumont, Sour Lake & Western.—See St. Louis & San Francisco.

Chicago, Peoria & St. Louis of Illinois.—A. L. Rosseter, Master Mechanic, has been appointed Superintendent of Motive Power and Equipment.

New York Central & Hudson River.—George W. Kittredge, who on April 9 became Chief Engineer of this road, graduated from the Massachusetts Institute of Technology in 1877. His first railroad service was in 1880 in the Maintenance of Way Department of the Pittsburg, Cincinnati, Chicago & St. Louis. He remained on the Pennsylvania Lines for 10 years in this department, and then was appointed Engineer of Maintenance of Way and Assistant Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis. In 1891 he was made Chief Engineer of that company, which position he has held until his recent appointment. He was also Chief Engineer of the Peoria & Eastern and of the Louisville & Jeffersonville Bridge Co. Mr. Kittredge is a member of the American Society of Civil Engineers, and was at one time President of the Engineers' Club of Cincinnati. He was a charter member of the American Railway Engineering & Maintenance of Way Association, and was its second President.

G. W. Kittredge.

National of Mexico.—J. M. Reid, Chief Engineer of Construction, has been appointed Chief Engineer, succeeding R. T. Macdonald, resigned.

New York Central & Hudson River.—G. A. Harwood, Designing Engineer for the Electric Zone, has been appointed Terminal Engineer at New York, succeeding A. B. Corthell, resigned on account of illness. V. Sparnberg succeeds Mr. Harwood.

St. Louis & San Francisco.—M. A. Hanson, Chief Engineer of the Beaumont, Sour Lake & Western, has been appointed Assistant Chief Engineer of the St. Louis & San Francisco, with office at St. Louis.

Union Pacific.—R. T. Guppy has been appointed Principal Assistant Engineer, succeeding R. L. Huntley, promoted.

Purchasing Agents.

Missouri Pacific.—S. P. Pryor, Purchasing Agent, has been appointed to the same position on three other Gould roads, the Texas & Pacific, the St. Louis Southwestern, and the International & Great Northern.

Wheeling & Lake Erie.—J. P. Stark, Purchasing Agent of this company, of the Wabash-Pittsburg Terminal, and of the West Side Belt, has resigned, to engage in other business at Toledo, Ohio.

LOCOMOTIVE BUILDING.

The New York, Chicago & St. Louis is in the market for 15 locomotives.

The Hokkaido-Tanko Railway, Japan, has ordered five locomotives from the American Locomotive Co.

The Kanawha & West Virginia has ordered one passenger and one freight locomotive from the American Locomotive Co.

The Seward Peninsula, Alaska, has ordered three locomotives from the Climax Manufacturing Co. Address J. W. Dixon, President, 40 Pine street, New York.

The Wabash will soon have 20 switching locomotives built at the Baldwin Works and 60 locomotives by the American Locomotive Co. The type of the latter has as yet not been decided upon.

The Mexican International, as reported in our issue of April 6, is in the market for 15 simple consolidation locomotives for delivery as early as possible. The specifications call for a total weight of

202,000 lbs., with 182,000 lbs. on drivers; cylinders, 22 in. x 30 in.; diameter of drivers, 57 in.; straight top boiler, with a working steam pressure of 200 lbs.; total heating surface, 2,648 sq. in.; 316 Shelby steel tubes, 2 in. in diameter x 15 ft. 3 in. long; firebox, 114 in. x 66 in.; tank capacity, 8,000 gallons, and coal capacity, 125 tons. The special equipment called for is as follows: Westinghouse air-brakes, Magnesia Sectional boiler lagging, Tower couplers, Dressel-Elliott acetylene headlights, Nathan non-lifting injectors, U. S. metallic piston rod and valve rod packing, Crosby safety valve, Leach's sanding devices, Nathan sight-feed lubricators, Crosby steam gages and steel wheel centers.

The Kansas City, Mexico & Orient has ordered eight Allfree-Hubbell type simple (2-6-0) and two Allfree-Hubbell type simple (4-4-0) locomotives from the American Locomotive Co., for December delivery. The 2-6-0 locomotives will weigh 168,000 lbs., with 145,000 lbs. on the drivers; cylinders, 20 in. x 28 in.; diameter of drivers, 63 in. over tires; wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 2,177 sq. ft.; 300 Seamless Tube Co. of America steel tubes, 2 in. in diameter and 12 ft. 9 in. long; carbon firebox, 108 in. x 40 in.; grate area, 30 sq. ft.; tank capacity, 7,000 gallons, and coal capacity, 12 tons. The 4-4-0 locomotives will weigh 140,000 lbs., with 99,000 lbs. on the drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 69 in. over tires; wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 1,590 sq. ft.; 230 Seamless Tube Co. of America steel tubes, 2 in. in diameter and 12 ft. 2 in. long; carbon firebox, 96 in. x 40¼ in.; grate area, 26.6 sq. ft.; tank capacity, 7,000 gallons, and coal capacity, 12 tons. The special equipment for both includes: Westinghouse air-brakes, Franklin K. & M. boiler lagging, National-Hollow brake-beams, Perfecto brake-shoes, Tower couplers, Handlan-Buck headlights, Ohio injector, Magnus journal bearings, Sullivan piston rod packings, Locomotive Appliance Co.'s valve rod packings, Hayden safety valve, Baltimore sanding devices, Chicago sight-feed lubricators, Railway Steel Spring Co.'s springs, Crosby steam gages, Economy and Gold steam heat equipment and Schoen tender wheel tires for 4-4-0 locomotives, and Davis cast-steel wheel tenders.

The Southern, as reported in our issue of April 6, has ordered 100 locomotives from the Baldwin Works as follows: Thirty-five six-wheel switching locomotives, 10 Pacific type locomotives, and 55 consolidation locomotives. Ten of the switching locomotives will weigh 145,000 lbs. each, with cylinders, 20 in. x 26 in.; diameter of drivers, 51 in.; wagon top boiler with a working steam pressure of 185 lbs.; heating surface total, 2,186.5 sq. ft.; 300 Detroit seamless steel tubes, 2 in. in diameter x 15 ft. 1½ in.; firebox, 65⅛ in. x 65¼ in.; grate area, 29 sq. ft.; tank capacity, 4,000 gallons, and coal capacity, seven tons. The remaining 25 six-wheel switching locomotives will each weigh 120,000 lbs., with cylinders 19 in. x 24 in.; diameter of drivers, 51 in.; wagon top boiler, with a working steam pressure of 185 lbs.; total heating surface, 1,550 sq. ft.; 246 tubes, 2 in. in diameter x 11 ft. long; firebox, 96⅛ in. x 41 in.; grate area, 27.37 sq. ft.; tank capacity, 4,000 gallons, and coal capacity, seven tons. The special equipment for all switching locomotives will include the Westinghouse air-brakes, Golmar bell ringers, Phillip-Carey Co.'s magnesia boiler lagging, Waycott brake-beams, Perfecto brake-shoes, Major couplers, Schroeder headlights, Hancock injectors, Ajax journal bearings, Jerome piston rod and valve rod packing, Coale safety valves, Water's sanding devices, Nathan bull's-eye sight-feed lubricators, Railway Steel Spring Company's springs and Ashcroft steam gages. The simple Pacific type locomotives will weigh 143,690 lbs. on drivers; total weight, 216,850 lbs.; cylinders, 22 in. x 28 in.; diameter of drivers, 63 in.; straight radial stayed wide firebox boiler, with a working steam pressure of 200 lbs.; total heating surface, 3,885 sq. ft.; 314 Detroit seamless tubes, 2¼ in. in diameter x 20 ft. long; firebox, 109¼ in. x 73 in.; grate area, 54 sq. ft.; tank capacity, 7,500 gallons, and coal capacity, 12½ tons. The consolidation locomotives will weigh 197,750 lbs., with 176,650 lbs. on drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 57 in.; straight boiler, with wide firebox, with a working steam pressure of 200 lbs.; total heating surface, 3,517 sq. ft.; 403 tubes, 2 in. in diameter x 14 ft. 6½ in. long; firebox, 107⅛ in. x 71¾ in.; grate area, 53 sq. ft.; tank capacity, 7,500 gallons, and coal capacity, 12½ tons. In addition to the special equipment as given for the six-wheel switching locomotives, the Pacific type and consolidation type locomotives will have the following specialties: McCord journal boxes, Barber roller trucks, Anaconda hose, Klinger "Reflex" water gages, Elvin driving box lubricators, Tate flexible staybolts, Sessions type "C" draft rigging, Bordo blow-off cocks, McLaughlin flexible joints, United States staybolt iron, and Hancock 6-in. chime whistles.

CAR BUILDING.

The Deepwater is in the market for one business car and nine coaches.

The Three States Lumber Co. has ordered one tank car from Robt. M. Burns & Co.

The Central Pennsylvania Lumber Co. has ordered one tank car from Robt. M. Burns & Co.

The Kanawha & West Virginia has ordered 20 flat cars of 60,000 lbs. capacity from F. M. Hicks & Co.

The Marion, Bluffton & Eastern has ordered eight additional cars from the Niles Car Manufacturing Co.

The Atchison, Topeka & Santa Fe, it is reported, has ordered 50 smoking cars fitted with steel underframes.

The Midland Linseed Despatch, Minneapolis, Minn., has ordered five steel tank cars from Robt. M. Burns & Co.

The Delaware & Hudson has ordered 1,000 hopper bottom gondola cars from the American Car & Foundry Co.

The Chicago & Alton has ordered 250 stock cars, 500 box cars and 250 flat cars from the American Car & Foundry Co.

The Seward Peninsula, Alaska, has ordered 30 flat cars from the Climax Manufacturing Co. Address J. W. Dixon, President, 40 Pine street, New York.

The Cincinnati, New Orleans & Texas Pacific has ordered two café cars from Barney & Smith. These cars will be 72 ft. 6 in. long, over sills, and 9 ft. 8 in. wide. The special equipment includes: Commonwealth bolsters, National-Hollow brake-beams, Perfecto brake-shoes, Westinghouse brakes, Janney-Buhoup couplers, Curtain Supply Co.'s curtain fixtures, Pantasote curtain material, Miner tandem draft rigging, Harrison dust guards, Gold heating system, Symington journal boxes, Newbold electric and Pintsch gas light, Empire roofs, Railway Steel Spring Co.'s springs and Pullman vestibules.

The Tehuantepec National has ordered 100 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for July delivery. These cars will be 34 ft. 4⅜ in. long, 8 ft. 5⅜ in. wide and 6 ft. 10¼ in. high, all inside measurements. The special equipment includes: Midvale steel axles, American Steel Foundries' bolsters, National-Hollow brake-beams, Christie brake-shoes, Westinghouse brakes, American Car & Foundry Co.'s standard brasses, draft rigging, journal boxes, paint and wheels, Tower couplers, Wagner doors, Simplex Railway Appliance Co.'s bolster springs and Diamond arch-bar trucks. Other specialties are: Hatch doors in roofs 10 ft. long to allow loading on wharves with cranes.

BRIDGE BUILDING.

ARKANSAS.—On April 5 the Upper House of Congress passed a bill authorizing the Tyronza Central Railroad to build a bridge over Little river in this state.

BELZONA, MISS.—Plans have been completed and bids will be asked by the Board of Aldermen April 30 for building an iron drawbridge over the Yazoo river. S. Castleman is Mayor.

CROWNPOINT, IND.—Bids will soon be asked by Charles A. Johnson, Auditor, for building a number of bridges in Lake County.

ELRENO, OKLA. T.—The new bridge which the Chicago, Rock Island & Pacific is to build over the South Canadian river at a point 10 miles south of this city will consist of five spans on concrete abutments, with a steel superstructure, to cost about $1,000,000.

FLORIDA.—A bill has been introduced in the Lower House of Congress authorizing E. L. Potter *et al* to build a bridge over the St. Johns river in this state.

JOLIET, ILL.—We are told by city officials that after more than six years' opposition and the passage of numerous compulsory orders, an agreement has been reached between the city and the railroads for extensive track elevation, with numerous subways at street intersections throughout the main portion of this city. An ordinance has been framed and has been accepted by the six railroads. Work is to be begun soon. It will probably extend over a period of two years and the cost will be about $2,500,000.

MISHAWAKA, IND.—Plans have been completed for building two steel bridges at a cost of about $80,000 each. The proposed structures will each have three 84-ft. spans. M. B. Russ is Commissioner.

MISSISSIPPI.—The Upper House of Congress on April 4 passed a bill authorizing a bridge over the Yazoo river, between the counties of Holmes and Washington, in this state.

NEW ORLEANS, LA.—Plans are again being revived for building a bridge over the Mississippi river a few miles north of New Orleans.

NEW YORK, N. Y.—Bids are wanted April 30 by James W. Stevenson, Commissioner of Bridges of the City of New York, for furnishing metal for the anchorage and for building the towers, cables, suspenders, and the suspended superstructure of the Manhattan bridge over the East river, between the Boroughs of Manhattan and

Brooklyn. The work calls for the use of about 40,000 tons of steel. Bids were let last August by the Bridge Commissioner, but a permanent injunction was issued restraining him from carrying out the terms of that contract. The bids now being asked for are to be based on new specifications.

Peoria, Ill.—Permission has been granted to the McKinley syndicate by the Federal authorities to build a bridge over the Illinois river at this place. Bids were recently opened in Chicago for the work, but it is improbable that contractors will undertake to have the piers completed by September 1 of this year as specified, and new bids may have to be asked for.

Peterborough, Ont.—Bids are wanted by S. R. Armstrong, City Clerk, April 14, for building a concrete steel bridge at Charlotte street.

Reading, Pa.—Bids are wanted April 20 by H. F. Livingood, County Controller, for building a concrete arch bridge over Morlattin creek, in Berks County.

Souris, Man.—Bids are wanted May 19 by J. W. Breakey for building a concrete culvert, also for two steel bridges 90 ft. each on concrete abutments, and for a steel bridge over the Souris river at Monteith Junction. Specifications can be had from the Public Works Department, Parliament Building, Winnipeg.

Strathcona, Alb.—An officer of the Canadian Pacific writes respecting the high level bridge to be built over the Saskatchewan river between this place and Edmonton, that it will be located at the foot of Ninth and Tenth streets, passing through the Hutchins Bay reserve at Edmonton. The bridge will be about 2,200 ft. long and 150 ft. above water level. Plans have not yet been decided upon as to the class of bridge to be built.

Woodstock, Ont.—Two bridges are to be built between North Norwich and Windham, one on the border of the county, and the other on the twelfth line.

Other Structures.

Altoona, Pa.—This company is to put up some new four-story buildings as additions to its shops at this place. The cost of the proposed structures and the machinery to be installed will be about $500,000.

Boston, Mass.—The New York, New Haven & Hartford, it is said, has bought land covering about 600,000 sq. ft. as a site for a new freight terminal.

East Somerville, Mass.—The Boston & Maine has decided to build extensive new shops. The company has owned the land, about 100 acres, for the past 10 years.

Fitzgerald, Ga.—This town has granted 200 acres of land to the Atlantic & Birmingham as a site on which the road will build large shops, to employ about 1,000 men.

Girardville, Pa.—The Schuylkill Traction Co.'s car barns were destroyed, also 13 cars, five of which were new, by fire April 3, with a loss of about $75,000.

Ottawa, Ont.—The Grand Trunk has plans ready for putting up a combined Central station and hotel east of the canal, to cost over $1,000,000.

Sacramento, Cal.—Plans have been completed by the Southern Pacific for the extension and rearrangement of its general shops here at a cost of about $3,000,000. About 100 acres of land will be bought to carry out these plans. It is probable that the present station will be abandoned and its site used for the shop extensions. The new erecting shop, completed last year, which is 80 ft. x 600 ft., will remain and be used as a base from which the new system of shops will be laid out. This building will be duplicated on the east and with its annex and adjacent shop will cover an area 320 ft. x 600 ft. There will be a new blacksmith shop 300 ft. x 600 ft. to replace the present structure, which is one-half that size. There will be a car-erecting shop 300 ft. x 600 ft., about double the capacity of the present shop; also a car shop 300 ft. x 600 ft., and new boiler shop 320 ft. x 600 ft. There will be a number of other buildings, each about 220 ft. x 600 ft., and two roundhouses of 32 stalls each.

Scranton, Pa.—An officer of the Lackawanna road says that no improvements are to be made in shop buildings at Scranton during the present year. The company will, however, put up some locomotive shops, but the general plans and details have not yet been decided upon.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alafia, Manatee & Gulf Coast.—This company has under construction 60 miles of road from Boca Grande Pass, on Charlotte Harbor, to Brownville, Florida. A bridge two miles long will be built over Gasparilla sound. Plans are being made for two steel and concrete drawbridges, one at Gasparilla sound and one at the Myakka river. The first lot of 70-lb. rails has been received and track is being laid north from Boca Grande. Extensive piers and docks are also under construction at Boca Grande. L. M. Fouts, 316 Duval Building, Jacksonville, Fla., is General Manager.

Bronx, Yonkers & White Plains (Electric).—The New York State Railroad Commissioners have issued a certificate to this company, which proposes to build a surface railroad from a point in the city of Yonkers to White Plains, about 11 miles.

Brush Creek & Crows Run.—A charter has been granted to this company in Pennsylvania, with a capital of $100,000, to build a railroad from a point of connection with the Pittsburgh & Western, near North Sewickley station, in Beaver County, to a point of connection with the Ohio River Junction Railroad, near New Sewickley. H. C. Parker, Pittsburg, Pa., is President. The Directors are: W. L. Shaw, Henry Culic, Edward Godfrey, H. W. Pratt, E. P. Rodgers, D. W. McNaugher, all of Pittsburg.

California & Oregon Coast.—This company, of which I. O'B. Gunn, of San Francisco, is President and Manager, and Colonel Wain-Morgan is Chief Engineer, is said to have completed surveys for its line and secured options on the necessary right of way, and on terminals and station grounds. The line of the proposed railroad is from Portland, Ore., south for a distance of about 250 miles (air line) to Takilma in the southwest corner of Oregon. The new road will cross the Rogue river, also the Applegate river, passing through a fine timber section as well as a rich copper belt. It will cross the Illinois river at Kirby. The southern terminus is now planned to be at Takilma, where the smelter of the Takilma Smelting Co., is located, but surveys have been made beyond this place over the Siskiyou into Del Norte County and across that county to Crescent City, where connection is to be ultimately made with a line from the south giving connection from Grant's Pass to San Francisco.

Canadian Pacific.—Contract is reported let by this company to J. D. MacArthur, of Winnipeg, Man., for building a 125-mile extension of the Kirkella, Manitoba, branch. Work is to be started at once.

A bill is before Parliament to authorize this company to build lines from New Westminster and Vancouver, and from Stonewall or Senden, in Manitoba, to the shores of Lake Manitoba.

This company has given a $1,250,000 contract to the Ross-Harris Company, Ltd., recently formed in Montreal. The contract calls for the building of a 50-mile section of this company's line between Parry and Byng Inlet on the new Toronto-Georgian Bay line, which is being built to give the Canadian Pacific a direct connection between Toronto and its main line to the west. The work is difficult and a large part of it will have to be built through rock. Work is to be started at once.

Canadian Roads.—Captain Edward Copp, of Detroit, who, with others has for the past two or three years been interested in the project, is planning to build a railroad from the north shore of Lake Superior north to Hudson's Bay. The proposed line will be about 550 miles long, starting at Nepigon, which is on the Canadian Pacific. The section to be traversed is rich in mineral resources, and much of it is adapted for agriculture.

Canyon City, Florence & Royal Gorge Interurban.—A contract has been let by this company to William White, of Florence, Colo., at about $24,000, for grading its proposed road from Canyon City, Colo., through Royal Gorge about 11 miles. Work is to be completed by July 1. (See Construction Record.)

Cape Charles.—Incorporation has been granted this company in Virginia to build a line 15 miles long. William A. Patton, of Radnor, Pa., is President.

Chicago & North-Western.—The Wyoming & North-Western line is now operated from Casper, Wyo., for a distance of 62.7 miles to Wolton.

Chicago, Rock Island & Pacific.—Plans, it is said, are being made for the development of the coal properties owned by this company in Williamson and Franklin Counties in Southern Illinois. It is proposed to build a new line, 95 miles long, connecting these coal properties with the Chicago & Alton at Springfield.

Colorado & Southern.—This company has opened a new line, called the Hamilton district, from Fort Collins, Colo., north to Hamilton, 10.8 miles.

Danville & Scottsville.—Incorporation has been granted this company in Kentucky, with a capital of $25,000, to build a railroad from Danville southwest through the counties of Boyle, Lincoln, Casey, Metcalf, Adai and Barren to Scottsville, in Allen County, about 100 miles. The incorporators are: J. G. Taylor, of Chicago; G. B. Cooper, Stanford; J. S. Murphy, McKinney; J. Brown, Liberty; J. B. Coffey, Columbus; J. H. Allen, Somerset, and J. Follette, M. M. Perkins, Ralph Leach and J. F. Allen, all of Cincinnati.

EDMONTON & ATHABASCA.—Application has been made for incorporation by Cross, Short, Bigger & Ewing, Solicitors, of Edmonton, Alb. The company proposes to build a railroad from Edmonton, Alb., north along the Athabasca river to Lac la Biche, 110 miles.

EL DORADO & WESTERN.—An officer writes that this company, which was recently incorporated in Arkansas to build a railroad from El Dorado, in Union County, southwest to Wesson about 10 miles, will let contracts for grading and bridge work about the 18th of this month. It is intended to have the road in operation by October. James Harrington, of El Dorado, is Chief Engineer.

GRAND TRUNK PACIFIC.—Contracts to build 50 miles of this road from Saskatoon, Sask., east, have been let to J. H. Armstrong and S. D. Lake.

The Trans-continental Railway Commission will soon ask for bids for ties and rails for the sections of this road between Winnipeg and Lake Superior Junction, and between Quebec and the head waters of the St. Maurice river.

GREAT NORTHERN.—In a letter to the Winnipeg Board of Trade, President J. J. Hill announces that he is planning to build a transcontinental line through the Canadian Northwest.

GREAT NORTHERN OF CANADA.—This company is making surveys to build a new line from St. Eustache, Que., to connect with a line from Carrillon.

GULF, COLORADO & SANTA FE.—An officer writes that a contract has been let to A. Moore for building a branch line under the name of the Pecos & Northern Texas, from Canyon City in Randall County south to Plainville, Tex., 58 miles, and that 80 per cent. of the grading has been completed. H. T. McGee, of Canyon City, is Chief Engineer.

HAMILTON, GALT & GUELPH (ELECTRIC).—Application for incorporation has been made to the Dominion Parliament to build an electric railroad from Hamilton, Ont., northwest via Galt, Preston, Berlin, and Waterloo, to Elmira, about 50 miles, also from Hamilton northwest to Elora and Fergus via Guelph, an additional 40 miles.

HARTWELL & WASHINGTON.—Residents of Washington, Ga., have applied for a charter for a company under the above name to build a railroad from Washington, north to Hartwell, about 60 miles. Surveys are to be started at once.

KANAWHA & WEST VIRGINIA.—Bids are wanted April 29 by N. C. Van Natta, Chief Engineer, at Charleston, W. Va., for the grading, tunneling, bridging and track laying on a 12-mile extension of this road.

KANSAS ROADS.—W. D. Egolf, of Kansas City, and E. H. Abadie & Co., of St. Louis, and associates, are planning to organize a company with a capital of $4,000,000 to build railroads connecting all the cities in southeastern Kansas.

KENTUCKY & TENNESSEE.—This company has now extended its road from Stearns to Yamacraw, eight miles, and has under construction an additional 13 miles.

KNOXVILLE, SEVIERVILLE & NEWPORT.—Preliminary surveys have been completed and the right of way secured for 50 per cent. of the proposed line, and a distance of 20 miles has been located. Contracts are to be let shortly for building the line, which is to run from Knoxville, Tenn., via Sevierville to Newport. J. Templeton, of Knoxville, Tenn., is President.

KOOTENAY CENTRAL.—The British Columbia General Contract Co. desires to sublet eight miles of grading on this road.

LAKE SHORE ELECTRIC.—Under the name of the Sandusky, Fremont & Southern, this company has filed articles of incorporation for the purpose of building a line either from Sandusky to Clyde or from Sandusky to Fremont, about 22 miles.

LANCASTER & NORTHERN.—A charter has been granted this company in Pennsylvania, with a capital of $100,000, to build a railroad from a point near Lancaster, to a point at or near Millway, in the same county. The President is H. G. Seip, Easton, Pa., and the Directors are Frank Reeder, Jr., R. W. Bowlby, F. C. Rockafellow, A. Duckworth, S. Worthington, A. Sausser, W. Coyle, all of Easton, Pa.

LAS VEGAS & TONOPAH.—This road has been opened from Las Vegas, Nev., on the San Pedro, Los Angeles & Salt Lake, northwest to Indian creek, 44 miles.

LEHIGH VALLEY.—Contract has been given by this company to J. F. Nolan, of Elizabeth, N. J., for grading and masonry work in connection with the change of the line at Towanda, Pa. The cost will be about $300,000.

LORAIN & ASHLAND.—The road which Joseph Ramsey, Jr., and associates is planning to build from Lorain, Ohio, on Lake Erie, to the Hocking Valley and other coal fields along the Ohio river, will be known by this name. (March 29, p. 91).

MIDLAND VALLEY.—This road has been extended from Pawhuska, Okla. T., to Silverdale, Kan., from which point trains are run over the Missouri Pacific to Arkansas City, Kan.

MINNEAPOLIS & ST. LOUIS.—A contract has been given by this company to E. O. Wesley, of Sioux City, Iowa, for building 11 miles on its proposed extension from Watertown, S. Dak., northwest to Aberdeen. The same contractor has put in a bid for building the line between Evarts and Pierre, S. Dak.

MISSOURI PACIFIC.—On the Memphis division of the St. Louis, Iron Mountain & Southern, a new line, called the Latour district, has been opened; it extends from Latour, Ark., south to McGehee, 69.51 miles.

NEW YORK, NEW HAVEN & HARTFORD.—The directors of this company have authorized the construction of a line from a point on the main line between Greenwich, Conn., and Port Chester, N. Y., north through Ridgefield to a point on the Highland division west of Danbury, a distance of about 30 miles. The new line, which is to be double track, will shorten the distance from New York to Danbury and Berkshire summer resorts by about 15 miles. The cost of the work will be about $2,500,000. This is the old Danbury, Ridgefield & Port Chester project.

President Mellen, replying to an inquiry, announces that the line between New Haven and Willimantic is to be straightened so as to make the distance between New York and Boston by this line approximately 200 miles, and that over this line trains can be easily run through in four hours by steam, "and in less time by electricity." Mr. Mellen says that passengers can be carried for as low a fare as on any other road, either existing or proposed; that the engineers are now at work upon the plans, and that the financing has been provided for; and that the line will be available for use before the rival electric line, which has been talked of in Massachusetts, can even obtain its charter. As the distance between New York and Boston by the Willimantic route is now 214 miles, Mr. Mellen's statement implies a radical rebuilding of the 54 miles between New Haven and Willimantic.

OREGON SHORT LINE.—The papers report that plans have been made to build a new line south of the present line from Malad City, Idaho, west to Mountain Home on the main line. It is said that surveys are completed and that work is to be commenced this summer. The new line will shorten the distance as compared with the existing line, about 134 miles.

PACIFIC & IDAHO NORTHERN.—Surveys, it is said, are to be resumed at once by this company from a point where they were abandoned last winter, and to be run north to a connection with the Northern Pacific, somewhere in the neighborhood of Grangeville, Idaho. A number of grading contracts have already been let and work is to be started as soon as the snow is off the ground.

PECOS & NORTHERN TEXAS.—See Gulf, Colorado & Santa Fe.

PENNSYLVANIA.—A contract has been given by this company to the New York Contracting Co., at about $4,500,000, to excavate two blocks in the city of New York, bounded by Ninth and Tenth avenues and 31st and 33d streets, to a depth of about 65 ft., and to build retaining walls. The company originally intended to run a tunnel across this track, but has recently decided that this would be impracticable; and, moreover, that the whole of this territory will be needed for a wide approach to the new station. Most of the excavation will be in hard rock.

PESCADERO RAILWAY & IMPROVEMENT.—Incorporation has recently been granted a company under this name in California, with a capital of $60,000, to build a railroad up Pascadero creek, beginning at its intersection with the Ocean Shore Railroad, for a distance of eight miles. John R. Rogers, Chief Engineer of the Ocean Shore, is one of the incorporators. The new line will run through a rich timber section.

PHILADELPHIA ELEVATED & SUBWAY CO.—Application has been made in Harrisburg by a company under this name for incorporation, with a capital of $30,000, to build an elevated and subway passenger railroad between 63d street and the Delaware river in Philadelphia, practically over the same route as that of the recently abandoned project of the Philadelphia & Western. The new company is backed by Philadelphia and New York capitalists, including A. I. Du Pont, Vice-President of the Du Pont Powder Co.; E. L. Erlanger and M. Klaw, Theatrical Managers of New York, and Phelix Isman and Edward Davis, Jr., of Philadelphia. The elevated structure is to be about three miles long, and the subway about two miles.

QUEBEC MIDLAND.—A bill is now before the House to incorporate this company, which proposes to build a railroad from a point on the inter-provincial boundary between Quebec and Ontario to a point on the west shore of Lake Mattagami, in the Province of Quebec. The office of the company will be in Ottawa. The directors are: J. E. Hurdman, A. Wilson, R. B. Owens and H. Mitchell, of Montreal, and F. H. Chrysler, of Ottawa.

RAWLEY & SOUTHPORT.—This road has been extended from Lil-

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

Salina & Northwestern.—Surveys are under way for this road from Salina, northwest via Lincoln to Osborne, Kan., 70 miles. G. H. Whitcomb, Salina, Kan., is President.

Salina, Tipton & Northwestern.—Incorporation has been granted the above company in Kansas, with a capital of $2,500,000, to build a railroad from Salina, northwest through Salina, Lincoln, Mitchell, Osborne, Jewell and Smith Counties. The incorporators are said to be all residents of Kansas City.

Sandusky, Fremont & Southern (Electric).—See Lake Shore Electric.

Santa Rosa & Northern (Electric).—This company has been incorporated in California, with a capital of $500,000, by W. A. Cattell, E. T. McMurray, J. H. Sanford, W. G. Taylor and P. S. Scales, all of San Francisco. The company proposes to build a railroad from a connection with the Petaluna & Santa Rose Railway at Santa Rosa, Cal., to Healdsburg, and thence up the Dry Creek Valley. The road will probably be operated by electric power.

Saskatchewan & Alberta.—Incorporation has been asked for in Canada by a company under this name to build a railroad from Moose Jaw, Assin., south to the international boundary, about 100 miles, with a branch west to Swift Current, an additional 100 miles. This is said to be one of Mr. Hill's projects. Charles E. Armstrong, of Calgary, Alb., is solicitor for the company.

Southeastern.—Incorporation has been granted this company in Kentucky to build a railroad from Jackson, southeast to a point in Letcher County about 70 miles. Woodson Poor, G. Dennis, A. T. Holcomb, Jr., and L. J. Hopp, all of Cincinnati, are the incorporators.

Steubenville & East Liverpool.—This company, which was recently organized in Ohio by stockholders of the East Liverpool Traction & Light Co., will, it is understood, take over the property of the Steubenville Traction & Light Co., and build an eight-mile connecting line between Toronto and Wellsville. The incorporators are: Van Horn Ely, of Buffalo; E. McDonnell, C. A. Smith, J. C. Rothery and G. H. Owen.

Texas Railway.—An officer writes that this company, which was incorporated last month, with a capital of $1,000,000, will build a railroad from Port O'Connor, on the Gulf of Mexico, near Pass Calvallo, via Victoria, Yoakum, and Gonzales to San Antonio, Tex., with branches from Yoakum to La Grange and Seguin to New Braunfels, a total distance of 260 miles. The office of the company will be at San Antonio. F. W. Weeks, Chairman of the Board of Directors.

Tioga & Clinton.—A charter has been granted to this company in Pennsylvania, with a capital of $300,000, to build a railroad from a point of connection with the Arnot & Pine Creek Railroad at or near the village of Morris, Tioga County, Pa., to a point in Chapman Township, Clinton County, Pa. H. T. Hall, Lock Haven, Pa., is President. The Directors are B. F. Geary, James C. Smith, H. T. Hudson, C. O. Dunlap, John T. Cupper, H. T. Hall, all of Lock Haven, Pa., and E. S. McNaul and M. W. Denman, of Philadelphia.

Tombigbee Valley.—Bonds are being offered by this company to secure funds for extending its road from its present northern terminus, near Healing Springs, Ala., north to a point near Butler in Choctaw County. The proposed line will pass through a rich cotton and timber section.

Western Pacific.—Bids are wanted at once by Chief Engineer V. G. Bogue for building 109 miles of this line in Nevada. This will include practically all of the heavy work not yet let, between San Francisco and Salt Lake. This section extends from the Nevada-Utah boundary to Deeth on the Humboldt river, and includes about 25 miles or more of heavy rock work and all the tunnel work included in the plans in the eastern part of Nevada. Plans have been approved for a tunnel 12,000 ft. long through the Pequop range, and bids will soon be called for this work. It is expected to have about 8,000 men at work between Salt Lake and San Francisco during the summer.

Wisconsin Central.—Bids are wanted April 15 by C. N. Kalk, Chief Engineer, Milwaukee, Wis., for grading work at a point six miles south of Ashland, involving the removal of about 400,000 cu. yds. of earth.

Wyoming & Northwestern.—This line is now operated from Casper, Wyo., for a distance of 62.7 miles to Wolton.

Zitabuaro & Joconusco.—This road has been opened from Zitacuaro, Mex., to Galeras 9.3 miles.

Yreka Railroad.—This road, which is seven miles long, running from Montague, Cal., on the Southern Pacific, to Yreka, was recently sold to Scott & Van Arsdale, of San Francisco. The new owners are planning to spend about $800,000 extending the road to Etna, in Scott Valley, via Fort Jones and Greenview.

RAILROAD CORPORATION NEWS.

Alabama Great Southern.—This company has sold to Potter, Choate & Prentice, of New York, $1,479,000 4½ per cent. 10-year car trust notes, maturing in equal semi-annual instalments.

Chicago, Indiana & Southern.—This new company, under which name the Indiana, Illinois & Iowa and the Indiana Harbor are to be consolidated, will have $15,000,000 common, and $5,000,000 4 per cent. cumulative preferred stock. It is said that the Lake Shore & Michigan Southern has bought $17,000,000 of this stock and the Michigan Central the rest. The I., I. & I. owns or leases 250 miles of road; it has outstanding $5,000,000 capital stock, which is all owned by the Lake Shore, and $4,850,000 first mortgage 4 per cent. bonds of 1950. The Indiana Harbor was until recently a local road, but this year has been extended and now connects Indiana Harbor, on Lake Michigan, with Danville, Ill., 110 miles south, opening up valuable coal lands for the New York Central Lines. It was built and equipped by the Lake Shore, and the Michigan Central at a cost of about $11,000,000.

Cincinnati, New Orleans & Texas Pacific.—This company has sold to Potter, Choate & Prentice, of New York, $1,938,000 4½ per cent. 10-year car trust notes maturing in equal semi-annual instalments.

Delaware & Eastern.—The Guarantee Title & Trust Co., Pittsburg, is offering at par the last $100,000 of an issue of $800,000 first mortgage 5 per cent. bonds of 1905, the total authorized issue being $1,000,000, of which $200,000 is reserved for future improvements. The proceeds of the sale of the bonds outstanding are being used to build the road from East Branch, N. Y., on the New York, Ontario & Western, northeast to Arkville on the Ulster & Delaware, about 40 miles, and a nine-mile branch from Union Grove to Andes, N. Y. Construction was begun Sept. 1, 1905, and about 15 miles of the road are now in operation. The capital stock of the company is $600,000.

Fort Wayne, Van Wert & Lima Traction Co.—E. H. Rollins & Sons, of Chicago, are offering the unsold portion of a block of $1,400,000 first mortgage 5 per cent. bonds of 1930. The interest of these bonds is guaranteed by the Lima & Toledo Traction Co., which leases the Fort Wayne, Van Wert & Lima. The last-named company owns 60 miles of interurban road between Fort Wayne, Ind., and Lima, Ohio.

Indiana Harbor.—See Chicago, Indiana & Southern.

Indiana, Illinois & Iowa.—See Chicago, Indiana & Southern.

Kansas City, Mexico & Orient.—The Texas Railroad Commission has given permission to this company to issue $10,984,400 bonds at $20,000 a mile on its road built and to be built in Texas. The application, it is said, makes the following statement of the present status of the work:

"According to the plans of the engineers, the road in Texas will eventually cost $34,500 per mile, or a grand total of $18,948,000, but it is desired to issue bonds at present only on a basis of $20,000 per mile. Of the 549 miles, the right of way has been acquired for 84 per cent., or 461 miles; 191 miles has been graded, viz., 160 from Sweetwater north to Red River, and 31 south from Sweetwater toward San Angelo; and 62 miles have been laid, from Sweetwater to Rule, Haskell County, 53 of which are in operation. Construction expense to date, $993,500; material on hand, $180,000; engineering and legal expenses, $150,000."

Missouri, Kansas & Texas.—This company has declared a semi-annual dividend of 2 per cent. on its $13,000,000 outstanding 4 per cent. non-cumulative preferred stock. This is the first dividend paid on any stock of the company since its reorganization in 1890.

New York Central & Hudson River.—Gross earnings for the quarter ended March 31 were $21,292,255, an increase of $2,849,166.

St. Louis, Rocky Mountain & Pacific.—This company, which was organized last year to build 120 miles of road from Des Moines, N. Mex., west and southwest to Colfax County, and which at that time owned or had mining rights in over 500,000 acres of coal lands, has, it is reported, bought 800,000 acres more in Colfax County for a price said to be $15,000,000.

Southern.—This company has filed with the Secretary of State of Mississippi an equipment mortgage for $9,000,000, covering 100 locomotives and 10,000 cars.

Tonopah & Goldfield.—Charles D. Barney & Co., New York, are offering at 100½ the unsold balance of a block of $1,150,000 Tonopah & Goldfield first mortgage 6 per cent. bonds of 1921. According to the terms of the mortgage, 1/15 of the bonds issued shall be retired annually at 102½ and interest by lot; provision is also made that the entire issue is subject to redemption at the same price on any interest date after Jan. 1, 1907.